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ABSTRACT

This Memorandum describes a computer program for calculating, except for facilities, the required resources and related costs of formal advanced pilot training courses. Facilities are assumed to be inherited and hence are treated as sunk costs. The program is based on a previously presented methodology. The first three sections of this Memorandum deal with a general description of the program and its operations. Specific operating instructions are given in Section IV. In conjunction with Section IV, appendices are presented showing a listing of all program variables used in the calculations, detailed flow charts of the program, and a source listing [FORTRAN-IV (IBM 360/365)] of the program. Program outputs are discussed in Section V. For related documents see AC 010 340-342 and AC 010 344-347. (Author/CK)

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RM-6087-PR
DECEMBER 1969

THE PILOT TRAINING STUDY: A User's Guide to the Advanced Pilot Training Computer Cost Model (APT)

H. E. Boren, Jr.

PREPARED FOR:
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The RAND Corporation
SANTA MONICA • CALIFORNIA

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This study is presented as a competent treatment of the subject, worthy of publication. The Rand Corporation vouches for the quality of the research, without necessarily endorsing the opinions and conclusions of the authors.

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PREFACE

In April 1967, the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs) formed a Pilot Advisory Committee to study "Pilots as a National Resource." The Committee consisted of the Assistant Secretary and a representative of each of the three Services. Staff members from Rand were invited to attend the early meetings of the Committee. The outgrowth was that the Air Force member requested Rand to accept responsibility for examining the Air Force pilot training process. The objective of the Rand Pilot Training Study was to develop a series of computer models for use in estimating the resources required to produce pilots and the costs of training them. Further, the models were to be designed for sensitivity analyses and long-range planning.

For the convenience of readers whose interests may not extend to all aspects of the pilot training process, the results of the study are presented in eight volumes, as follows:

Volume		
I	RM-6080-PR	The Pilot Training Study: Personnel Flow and the PILOT Model, by W. E. Mooz
II	RM-6081-PR	The Pilot Training Study: A User's Guide to the PILOT Computer Model, by Lois Littleton.
III	RM-6082-PR	The Pilot Training Study: Pre-commissioning Training, by J. W. Cook.
IV	RM-6083-PR	The Pilot Training Study: A Cost-Estimating Model for Undergraduate Pilot Training, by S. L. Allison.
V	RM-6084-PR	The Pilot Training Study: A User's Guide to the Undergraduate Pilot Training Computer Cost Model, by Lois Littleton.
VI	RM-6085-PR	The Pilot Training Study: Advanced Pilot Training, by P. J. Kennedy.
VII	RM-6086-PR	The Pilot Training Study: A Cost-Estimating Model for Advanced Pilot Training, by L. E. Knollmeyer.
VIII	RM-6087-PR	The Pilot Training Study: A User's Guide to the Advanced Pilot Training Computer Cost Model (APT), by H. E. Boren, Jr.

This Memorandum, Volume VIII of the series, describes the computer program for the Advanced Pilot Training Cost Model (APT),* which is designed to be used for estimating the resources and costs required to train pilots in formal advanced courses [Combat Crew Training Schools (CCTS), Replacement Training Units (RTU), or Transport Training Units (TTU)]. This model is not designed to cover the types of advanced flying training such as proficiency flying, upgrading training, special weapons training, and training for miscellaneous types of aircraft for which no formal school exists. These types of advanced training are accomplished in less formal programs after the pilot is initially qualified to fly the particular aircraft involved.

The procedures described in this Memorandum may be followed without reference to the other Memorandums in the series. However, for an understanding of the purposes for which the cost model was constructed, the user will find it useful to read Volumes VI and VII which describe the advanced pilot training (APT) program. It is further suggested that the user read Volume I for an understanding of the part that APT plays in the total process of training USAF pilots.

*In this Memorandum, the term APT refers to the Advanced Pilot Training Computer Cost Model (program).

SUMMARY

This Memorandum describes a computer program (APT) for calculating, except for facilities, the required resources and related costs of formal advanced pilot training courses. Facilities are assumed to be inherited and hence are treated as sunk costs. The program is based on the methodology presented in RAND Memorandum RM-6086-PR cited in the Preface.

The first three sections of this Memorandum deal with a general description of the program and its operations. Specific operating instructions are given in Section IV. In conjunction with Section IV, appendices are presented showing a listing of all program variables used in the calculations, detailed flow charts of the program, and a source listing [FORTRAN-IV (IBM 360/65)] of the program. Program outputs are discussed in Section V.

CONTENTS

FIGURES

I. INTRODUCTION

The APT computer program computes the required resources and attendant costs for Advanced Pilot Training, given such basic inputs as syllabus requirements and numbers of students entering APT from duty assignments involving similar aircraft, from duty assignments involving dissimilar aircraft, from desk jobs, and from undergraduate pilot training (UPT). All required facilities (the physical plants) are assumed to be inherited and are treated as sunk costs. Hence, the calculations do not include any facility construction costs.

Long and short courses are available in this program for each aircraft system. The long course is for students from dissimilar aircraft, from UPT, and from desk jobs, for whom more extensive training is required. The short course is for students from similar types of aircraft. For any aircraft system, the program deals with as many as five categories of equipment, namely, three types of training aircraft, simulators, and trainers.

The information presented in this Memorandum is supplementary to that presented in RM-6086-PR.* That publication describes in detail the methodology employed in the APT model. Since the APT program was developed to reflect explicitly that methodology, a detailed line-by-line description of the program is not considered to be necessary. Instead, this Memorandum deals with a general description of the computer program (Section II), program considerations (Section III), input procedures (Section IV), and program outputs (Section V).

The APT computer program is written completely in FORTRAN-IV for use on the RAND IBM 360/65 computer system and is totally self-contained. Except for the standard input/output devices, it does not require any auxiliary tapes or disks and does not use any auxiliary programs. As a result, it should be adaptable to other computer systems.

*See Preface.

A listing of all variables used in the program calculations is given in Appendix A. Detailed flow charts showing each step of the program are presented in Appendix B. Finally, the FORTRAN-IV source program is listed in Appendix C.

II. GENERAL DESCRIPTION

OPERATION

The APT computer program is structured so that a single sess: on the computer will process as many runs as desired, or as time permits. Each run consists of one or more weapon systems for one or more years of operation. The program prints the results by weapon system for one year at a time. A run may comprise as many weapon systems and years as the user desires or, again, as time permits. A major feature of the APT program is that, within a run, once a complete set of inputs is entered for the first year of the first weapon system, only changes in those inputs need to be entered for succeeding years and for succeeding weapon systems. Hence, the program is highly suited to sensitivity analyses in which one may wish to determine the effect of input variations.

One pass is made through the program for each year of each weapon system. Thus, if a run were to consist of 10 weapon systems and 15 years for each weapon system, 150 passes would be made through the program for that run. Each pass requires approximately 0.25 second (360/65 central processing unit time), depending on some of the options exercised by the user. For each pass, the relevant resources and costs are calculated and printed in prescribed formats. In addition, two optional printouts are provided for printing the values of the variables used in the program.

Because of the repetitive nature of many of the calculations, one subscripted variable (F) is used for all program variables so that such calculations are made with only one set of equations with variable-subscripted parameters. Thus, through use of DO-loops in the program, the machine goes through such calculations as many times as required, using the one set of equations and each time increasing, in prescribed increments, the appropriate parameter subscripts. This approach reduces the size of the program, in terms of both the FORTRAN instructions and the Common Block listing of the variables.

OPTIONS

The F variable used in the program is dimensioned 310, which allows for both the input and output data. An optional printout is provided for listing the F array in tabular form. This listing is labelled "Common Dump." It includes the value of each F variable and the corresponding subscript. Such a listing may be exceedingly useful in the analysis of various runs since much of the data--particularly numbers generated in the form of intermediate calculations--do not appear on the output pages. With the aid of the Common Dump and the variable listing (Appendix A), which also lists the subscript (called address) of each F variable, the user can find the value for any subscript so listed--hence any input or output variable. The Common Dump is actually a permanent record of the values of all of the F variables for any pass through the program.

An alternative method is provided for printing out values of the F variables used in the program, in which the address, name, and value of the variable are listed on one line. This option has the advantage of providing complete information to the user concerning the F variables he selects to be listed. Another advantage is that the user may select only the variables he desires to be listed. A disadvantage is that more pages of output may be required, depending on the number of variables listed. For example, if all 310 variables are listed, six pages are required compared with only one page for the Common Dump listing of all variables. Also, this option requires that all 310 cards containing the F-variable listing must be entered as input data.

As stated previously, this model applies only to pilots who are trained in formal Advanced Pilot Training Schools. The pilots for whom this model is not applicable may be grouped into two categories: those who are not trained formally in advanced pilot schools and those who are trained, as required, in small numbers. A substantial number of aircraft types is involved in this group of pilots for which either

valid cost data are not available or use of the model is not practical. However, the percentage of such aircraft is relatively small (approximately 7 percent of the total aircraft inventory).

If, for a single computer run, the user wishes to account for all pilots trained, including those whose costs are not computed in this model, he may do so by applying the zero-output designator to this latter group of pilots. Then, the costs and resources required will be printed for all weapon systems except those for which the zero-output designator is used. For each of those, the only output is the number of graduates.

An option is provided the analyst for calculating the number of simulator maintenance and operating personnel. This value may be calculated either as a function of the number of simulators required or as a function of the total number of student simulator hours charged to pilot training. This is done automatically in the program by using the magnitude of the input variable relating to the number of simulator operating and maintenance personnel authorized. If this value is equal to, or greater than, 1.0, it is treated as an authorized number per simulator. If the value is less than 1.0, it is treated as an authorized number per simulator hour. Hence, depending on its magnitude, this input variable is multiplied by either the number of simulators required or the number of student simulator hours charged to pilot training to give the number of simulator maintenance and operating personnel.

Finally, an option is provided for setting all input F variables to zero. Normally, for each run the values of these variables are retained from pass to pass so that, as stated previously, the user only has to enter changes in the inputs. However, there may be occasions for the user to zero all input variables so that he can start a new pass with all variables set to zero. This may occur when many years or many weapon systems, or both, have been run, and the user finds it difficult to keep track of the current values of some of the input variables. Initially, all F variables--input and output--are set to zero; then, at the start of succeeding passes through the program, most of the output variables are set to zero.

A summary of the designators used to exercise the various program options is given in Table 1.

Table 1

PROGRAM OPTIONS

Designator	Variable	Description
Dump printout	F(117)	0. --Do not print Common Dump 1.0--Print Common Dump
Zero-output	F(118)	0. --Do not omit all calculations except number of graduates 1.0--Omit all calculations except number of graduates
Clear	F(119)	0. --Do not zero all input variables 1.0--Zero all input variables after printout
Weapon system variable-listing	F(120)	0. --Variable addresses, names, and values not to be listed 1.0--Variable addresses, names, and values to be listed for this pass through program. F(120) is then set to zero.
Variable-listing read (Constant input data)	F(141)	0. --Addresses and names of all variables not to be read 1.0--Addresses and names of all variables to be read once
Simulator operating and maintenance personnel authorized	F(071)	≥1.0--Per simulator required <1.0--Per simulator hour

III. PROGRAM CONSIDERATIONS

FLOW OF OPERATIONS

Figure 1 is a flow chart showing the general flow of operations through the program. These operations are described in this section.

Initially, all input F variables in Common are set to zero. Several other internal indexes are also initialized (for example, page number). Next, a title card is read which contains the general title for the entire run. The constant input data [F(121)...F(141)], excluding F(135), are then entered. These values are referred to as constant input data because they are usually constant for a run or runs and do not vary with weapon system or year. However, if the need arises, any of them may be treated as a weapon system input and entered as such for any pass through the program. Next, the title and page number are printed on a new page.

If, for at least one of the passes through the program, the user will require a listing of the addresses, names, and values of the variables, he must enter a 1.0 for the "read" designator in the constant input data [F(141) = 1.0]. If this is done, the machine then reads in the complete listing of all of the program variables (310 cards) so that the addresses and names are stored as alphanumeric information for subsequent printouts. This listing is read in only once. On the other hand, if this designator is not entered with a value of 1.0 in the constant input data, the variable listing of 310 cards must not be entered. Next, the current equipment inventories are set to zero. For subsequent years of the same weapon system, these values are not set to zero but are updated by adding to them the equipment to be procured and, in the case of aircraft, subtracting the attrition aircraft. They are reset to zero for each new weapon system. All calculations pertaining to equipment resources, including costs, are always performed throughout the program in order of aircraft types 1, 2, and 3 (as applicable); simulators; and trainers.

After the equipment inventories are set to zero and other initialization is completed, the weapon system number and name are read on a

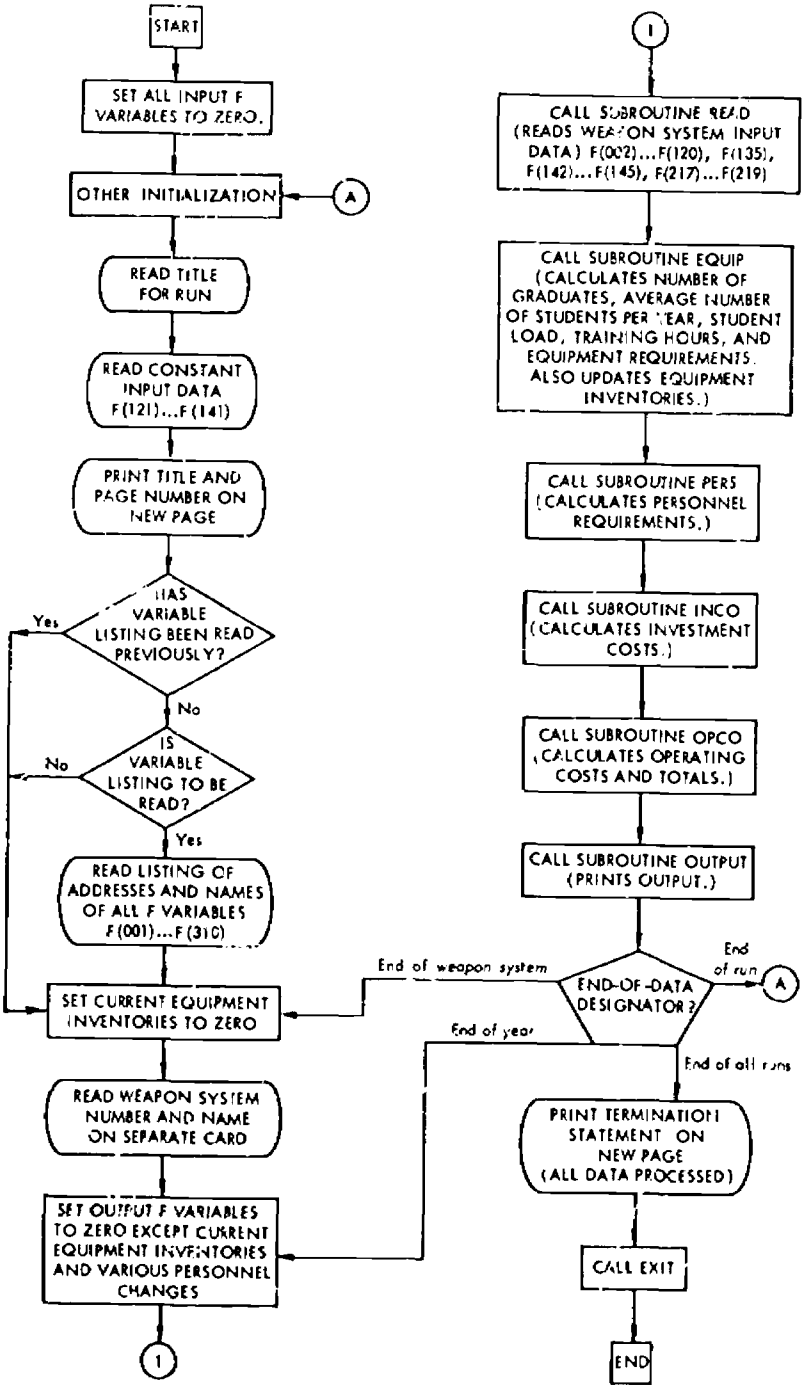

Fig. 1--Flow of operations

separate card. At this point all of the output variables are set to zero except for the current equipment inventories and various personnel changes. The remaining major operations involve calling the subroutines to perform their specified tasks. First, subroutine READ is called to read in the weapon system input data [F(002...F(120), F(135), F(142)... F(145), F(217)...F(219)].* Subroutine EQUIP is then called to calculate the various training hours and equipment requirements. Also, the number of graduates, the average number of students per year, and the average student loads are calculated in this subroutine since they are required for subsequent calculations in the same subroutine. Equipment inventories are then updated in subroutine EQUIP.

Subroutine PERS is called next to determine all of the personnel requirements including the incremental changes from year to year, required for certain calculations. All of the instructor, maintenance, administrative, and support personnel are determined in this subroutine, These people are further categorized into rated officers, non-rated officers, airmen, and civilians.

Following the personnel calculations, subroutine IFCO is called to determine the investment costs charged to pilot training. In like manner, subroutine OPCO is called to determine the operating costs and also the various total costs required for the output summary. All costs are calculated in thousands of dollars except for the operating cost per graduate, which is in dollars. Finally, subroutine OUTPUT is called to print the results in prescribed formats.

Depending on the end-of-data designator and whether all data have been processed, the path then returns to some earlier portion of the MAIN routine and commences the next pass through the program. If one year of a weapon system is completed with more years to follow, the path returns to the point at which all of the output variables are set to zero. If the last year of a weapon system has been completed with

*Initially, all weapon system input variables were intended to be F(001)...F(120), constant inputs to be F(121...F(145), and all output variables to be F(151...F(300). [F(146)...F(149) are internal indices.] However, as modifications were required, it was necessary to add some input variables with indexes out of order. This in no way affects the operation of entering the data, as will be seen subsequently.

more weapon systems to follow for that run, the path returns to the point at which the current equipment inventories are set to zero. If the run is completed (with more runs to follow) so that all weapon systems have been processed, all of the weapon system inputs are set to zero (in subroutine OUTPUT), and the path returns to an initialization point (A in Fig. 1) just before the point where the main title is read for the run. Finally, if all data have been processed for all runs, a termination statement is printed on a new page, and CALL EXIT is executed by the program ending the job at that point.

IV. INPUT PROCEDURES

GENERAL DESCRIPTION*

Many different sets of data may be entered into the computer, each set representing one year of a weapon system. Thus, there must be as many sets of input data as the product of weapon systems and years. The end of each set is signalled by an end-of-data designator. This designator is required for identifying whether the set of data constitutes the end of a year, a weapon system, a run, or all runs. After each set of data is read, all of the computations are performed on that set and the results are printed, before the next set of data is read by the machine.

As was stated previously, the F-variable array used in the program is dimensioned 310. The subscripts of F are referred to as addresses of F. Since F is the first array listed in Common, its addresses represent the relative locations of the subscripted F variables in Common.** Thus, F(001) represents the first F variable in Common, F(010) the tenth, and F(310) the 310th in Common. (Preceding zeros for the addresses have no meaning; they are used merely for convenience so that all addresses can be represented by three-digit numbers.)

Basically, the input procedures are structured so that the address of F is entered together with the value of the subscripted F as a pair. The machine then stores the value in the relative location in Common equal to the address. For example, if an address of 80 is entered with a value of 0.9, the program performs the following operation:

$$F(080) = 0.9.$$

INPUT DATA CARDS

The basic set of data represents one year of a weapon system. The first card of the first year of a set of weapon system data must always

*A specific summary on input data cards and their arrangement for one or more runs is given at the end of this section under Data Card Arrangement.

**The F array is listed in Appendix A.

be a title card. This card contains only the number and name of the weapon system under consideration. Columns 1-2 are reserved for the optional entry of the weapon system number (integer value). The weapon system title is read in cols. 5-44 as alphanumeric information, and the remaining portions of the card are not used. The weapon system number is stored as F(001) but is not used currently in the program or printed in the output. After development of the program, it was found that the weapon system number could be entered just as easily as alphanumeric information in the title portion and printed out as part of the title. However, it is there as F(001) if the user wishes to modify the program to make use of it. Hence, there is no requirement to enter a number in cols. 1-2 of this card.

The cards following the weapon system title card contain the input data for one or more years of the weapon system. In entering the numerical data, eight pairs of F addresses and the corresponding F values may be entered on one card. The address of each variable is entered as an integer in specified columns immediately preceding those allotted to the corresponding variable value. These specified columns, or fields, for the addresses are three columns wide and start in any column ending in "1." Thus, cols. 1-3, 11-13, 21-23, 31-33, 41-43, 51-53, 61-63, and 71-73 are allotted for the addresses. The corresponding fields for the F values (real numbers) are six columns wide and start in any column ending in 4. Therefore, cols. 4-9, 14-19, 24-29, 34-39, 44-49, 54-59, 64-69, and 74-79 are reserved for the corresponding F values. The implied decimal point location in each "variable" field is between the third and fourth columns of those fields--for example, between cols. 6 and 7 or 16 and 17, etc. Of course, a punched decimal point will override the implied decimal point location.

Because the address of any variable is entered with the value of the variable as a pair, the pairs may be entered in any order of address. However, the address and the value of the variable must always be kept together as a set. Pairs of blank fields (for example, cols. 1-3, 4-9) are not processed in the program. On the other hand, if addresses are entered that are less than zero, or zero with a non-zero value for the variable, or greater than 145 (except for 217, 218, and 219, which

are the aircraft recurring investment cost factors), an error message is printed, and the run is terminated at that point. Negative or zero numbers are not legitimate numbers for addresses, and an address greater than 145 (except for the three addresses noted above) means that an output variable is being entered.

Figure 2 shows an input keypunch form that may be used to enter data for this program. Each field contains an address and data (value) pair. The vertical dashed lines are the implied decimal point locations. Thus, in the data field, three digits are allowed on each side of the decimal point for the F value, which are usually sufficient for most of the data. This is true because cost data must be entered in thousands of dollars except where noted by a dollar sign in the listing of Appendix A (see address 101, for example). Inputs noted by a dollar sign are entered in dollars. However, as was stated previously, those data values requiring more digits may be entered by simply keypunching the decimal points to override the implied decimal point locations. The cross-hatched columns (10, 20, 30, etc.) are not used, except to separate the fields.

A total of 148 inputs is listed in Appendix A [F(001)...F(145), F(217)...F(219)]. However, F(001) is not used as an input, and the 20 constant inputs [F(121)...F(141) excluding F(135)] are only entered once. Therefore, 127 is the maximum number of weapon system inputs that would ever be required for one pass through the program (usually for the initial, or base case, set of data). Since eight inputs can be entered on a card, a total of 127 divided by 8 or 16 data cards would be required, or 17 including the weapon system title card.

Since all inputs are set to zero initially, they will remain zero until a value is entered. Note, however, that for subsequent passes, if inputs are not entered, their previous values will be retained from year to year or from weapon system to weapon system. Therefore, if one does not want the value of an input to be retained for the next pass, one must enter a new value or a zero for the input.

An example of an input data card is shown in Fig. 3. Here, variables with addresses 098 through 105 are entered. Variable with address 098 has a value of 900; variable with address 099 has a value of 80; variable with address 100 has a value of 0.05, and so on.

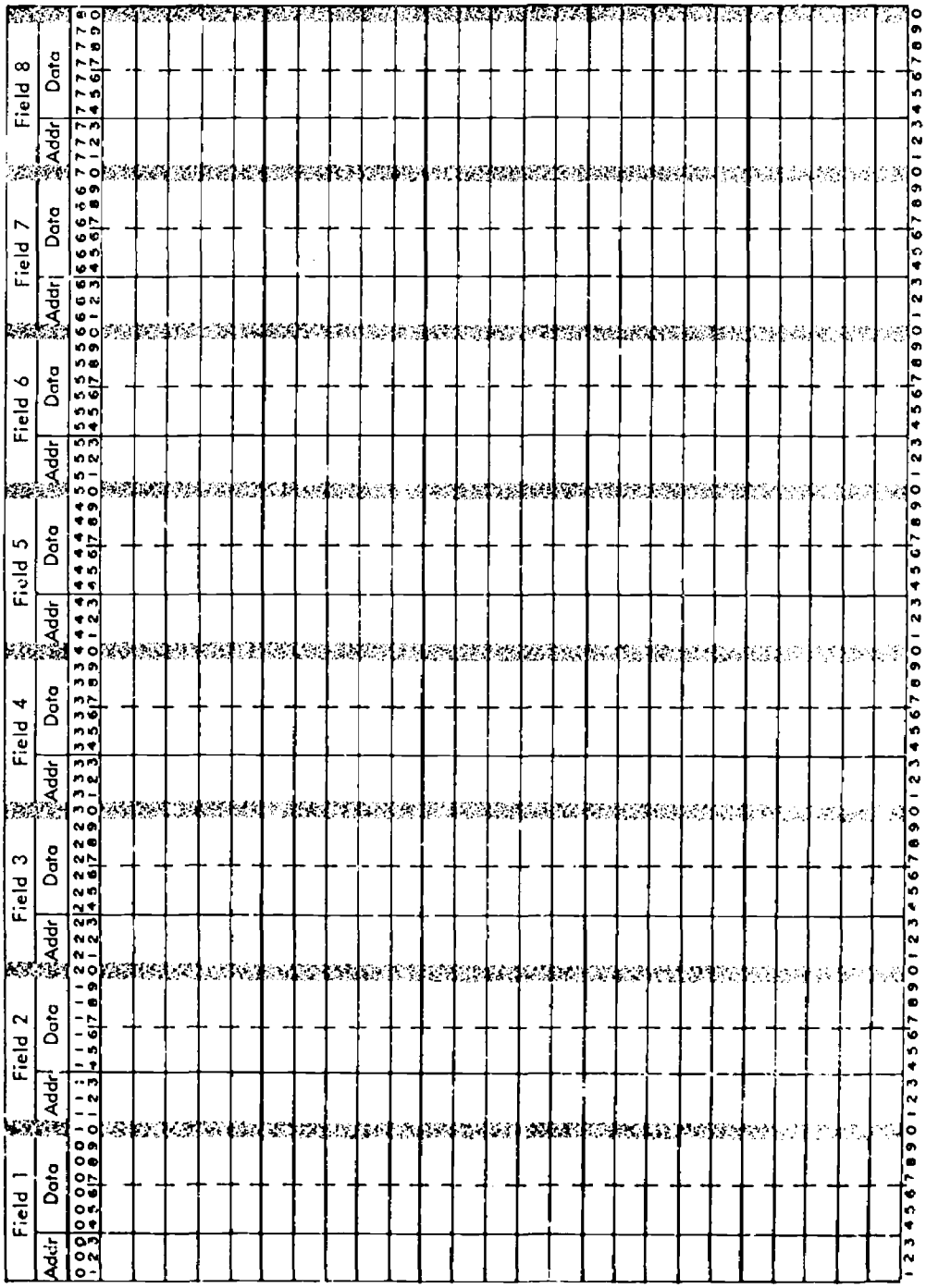

Fig. 2--Example of input keypunch form

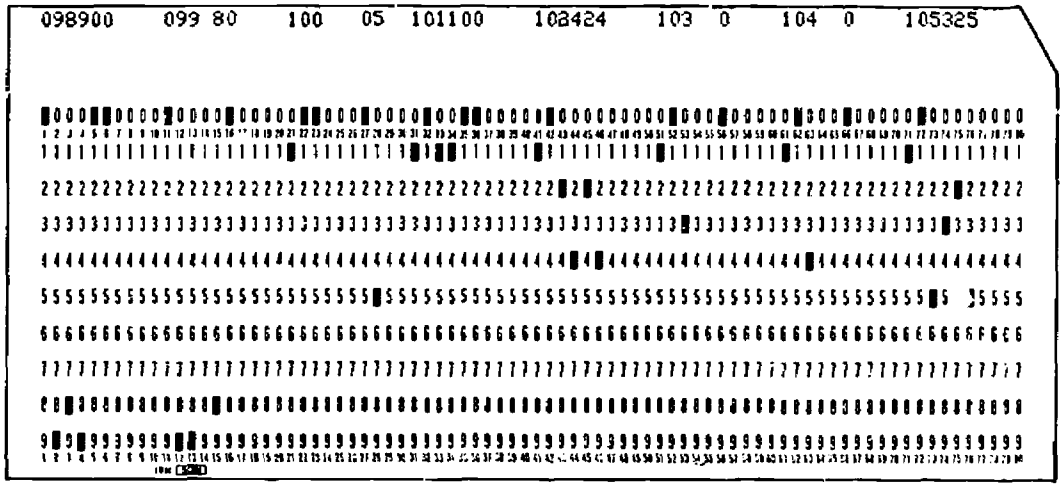

Fig. 3--Sample data card

VARIABLE-LISTING SELECTION DESIGNATORS

Variable-listing selection designators are used to designate which variable addresses, names, and values are to be listed when this option of listing the F variables is used. Unless all variables are to be listed (described in the next paragraph), four input cards are used each time some of the variables are to be listed. If the column numbers on these four cards are thought of as running continuously from card to card, one has 1...80 columns on the first card, 81...160 on the second, 161...240 on the third, and 241...320 on the fourth card. In the program the first 310 columns of these four cards are treated as corresponding to the 310 F variables in Common, and a numeral 1 punched in any of those columns will cause the variable with address corresponding to that column to be listed. For example, 1s punched in cols. 5, 80, and 172 will cause F(005), F(080), and F(172) to be listed.

If all variables are to be listed, only one card is required. A numeral 9 in column 1 will result in a printout of all F variables. This eliminates the necessity of punching 1s in all 310 columns.

The selection designator cards are always entered immediately after the set of weapon system data for which the variables are to be listed. In the set of weapon system data preceding the selection designator card(s), the variable F(120) must be entered as 1.0. This causes the selection designator cards to be read. Otherwise, F(120) is left at zero, and the selection designators are not entered. It should be noted that contrary to the general rule for input variables, the value of F(120) is always set to zero for the start of the next pass through the program--that is, a value of 1.0 for F(120) is not retained for the next pass through the program. Therefore, when selection designators are to be read for a set of data, F(120) must be entered as 1.0 in the set of data to which the selection designators apply. This was done so that the listing of variables in this form would require a positive action by the user. Also, this prevents the inadvertent carryover of 1.0 for F(120) to the next year for which the user does not want the variables listed in this way and thus has not entered the selection designator cards.

END-OF-DATA DESIGNATORS

There are four designators used to end the reading of a set of data for one year of a weapon system. They are three-digit sixes, sevens, eights, or nines (666, 777, 888, 999) and are entered in any of the address fields following the last data value entered. Once this designator is entered, the remaining fields of the card must be blank. A new set of input data must always start on a new card. The designator 666 indicates that one year of input data is completed with more years to follow for the same weapon system. Hence, the next card contains only numerical data beginning for the next year. A 777 indicates the end of all years for a weapon system with more weapon systems to follow. Thus, the next card must be a title card for a new weapon system set of data. An 888 indicates the end of a run--that is, the end of data for all years and for all weapon systems of a run--but that another run is to follow. Therefore, the next card must be a title card for a new run. The cards to follow would then be the same as those for the first run. If a new run is initiated, all weapon system input data are set to zero. The constant input data are retained, however.

For the second and subsequent runs, there is a provision for reading in the constant input data again. If there are no changes in these values from the previous run, one card must be entered containing the end-of-data designator 666 in any of the address fields (for example, cols. 1-3). Then, the previous constant input values will be retained.

Finally, a 999 designator indicates that the very last set of data has been entered. After this set is processed, the machine prints a termination statement on a new page stating that this is the end of the final run; hence all data have been processed. At that point CALL EXIT is executed, and the job is terminated. It is important to note that unless the end-of-data designators are entered properly in the address fields, the machine will continue to read data until no more data are available, thus causing premature termination of the job. Since the processing of pairs of blank fields is omitted in the reading of input data, the end-of-data designator may be entered in

cols. 1-3 on a separate card immediately following the set of data to which it applies. In some situations, this permits easier manipulation of a set of data.

DATA CARD ARRANGEMENT

Table 2 summarizes the types of input cards used for the APT program. In conjunction with Table 2, Table 3 is presented to show the arrangement of input data cards for two hypothetical runs. Run 1 consists of weapon systems A, B, and C, each to be operated for three years. Run 2 consists of weapon systems D and E to be operated for two and three years, respectively. A code index of the cards is given in Tables 2 and 3 to allow the user to cross reference the cards in the two tables.

For the runs shown in Table 3, the variable listing read designator F(141) must be entered as 1.0 in the constant input data since the variable listing is to be read next for later printout. Then, in the first year data set of weapon system A, the variable listing print designator F(120) must be entered as 1.0. This causes the machine to read the selection designators next for printing the F-variable listing. Also, F(117) is entered as 1.0 in that same first year data of weapon system A since the Common Dump is to be printed as well as the variable listing.

Finally, Table 4 is presented to summarize the address and data field locations on the data cards.

Table 2

SUMMARY OF INPUT CARDS

Code (see Table 3)	Type of Card	Remarks
1	Title of Run	First card of data deck for each run. Contains title of run in cols 1-80 (alphanumeric information).
2	Constant Input Data	Consists of constant input data F(121).. F(141) less F(135). End-of-data designator for this set of data is 666(last entry in any address field). For second or subsequent runs, at least one card with a 666 designator must be entered here. If only one such card is entered, previous constant input data are retained for the new run.
3	Variable Listing (310 cards) (optional)	If F(141) = 1.0 in constant input data, the F-variable listing of 310 cards is entered here. This listing is entered only once regardless of number of runs made. Each card of this listing contains the address (cols 1-3) and name (cols 7-72) of the F variable. If F(141) = 0.0 in the constant input data, this listing is not entered.
4	Weapon System Title	First card of first year of weapon system data. Contains title of weapon system in cols. 5-44. No data are entered on this card. (Cols. 1-2 were originally reserved for weapon system number, a number not currently required.)
5	Data for One Year of Weapon System	Contains data for one year of a weapon system. End-of-data designator 666 is used in address field at end of this set of data if more years of same weapon system are to follow. A 777 designator

Table 2 (continued)

Code (see Table 3)	Type of Card	Remarks
		is used if this is last year of weapon system with more weapon systems to follow in this run. An 888 designator is used if this is last year of last weapon system of this run with more runs to follow. A 999 designator is used if this is last set of data of last run. Job is then terminated after this data set is processed.
6	Variable-Listing Selection Designator (1 or 4 cards) (optional)	Used to designate which variables are to be listed. Always used immediately after set of data for which variables are to be listed. In that set of data F(120) = 1.0. If all variables are to be listed, a 9 is entered in col. 1 of a separate card entered here. Otherwise, four cards are used with a 1 entered in column numbers corresponding to addresses of variables to be listed. The four cards may be thought of as containing cols 1...80, 81...160, 161...240, and 241...320, the first 310 of which correspond to the F addresses.

Table 3

DATA CARD ARRANGEMENT FOR TWO RUNS

Code (see Table 2)	Type of Cards	End-of-Data Designator
1	Run 1 title card	---
2	Constant input data [F(141)=1.0]	666
3	F-variable listing (310 cards)	---
4	Weapon system A title card	---
5	Year 1 data [F(117)=1.0, F(120)=1.0]	666
6	Variable listing selection designators (1 or 4 cards)[a]	---
5	Year 2 data	666
5	Year 3 data	777
4	Weapon system B title card	---
5	Year 1 data	666
5	Year 2 data	666
5	Year 3 data	777
4	Weapon system C title card	---
5	Year 1 data	666
5	Year 2 data	666
5	Year 3 data	888
1	Run 2 title card	---
2	Constant input data (at least one card)	666
4	Weapon system D title card	---
5	Year 1 data	666
5	Year 2 data	777
4	Weapon system E title card	---
5	Year 1 data	666
5	Year 2 data	666
5	Year 3 data	999

[a]For this example whose outputs are discussed in Section V, only one designator card was used since all 310 F variables were listed.

Table 4

SUMMARY OF ADDRESS AND DATA FIELD LOCATIONS

Address Field[a] Location (cols) (integer)	Corresponding Data Field Location (cols) (real number)	Implied Decimal Point Location for Data Field (between cols)
1-3	4-9	6-7
11-13	14-19	16-17
21-23	24-29	26-27
31-33	34-39	36-37
41-43	44-49	46-47
51-53	54-59	56-57
61-63	64-69	66-67
71-73	74-79	76-77

[a]Address fields are also used for end-of-data designators (666, 777, 888, or 999). The end-of-data designator is always the last entry of each year (set) of weapon system data.

V. PROGRAM OUTPUTS

Examples of outputs generated by the program are depicted in Figs. 4-17. The particular data shown are used only to illustrate the types of outputs obtained from the program.* The outputs represent the systems listed in Table 3. In this example, both the Common Dump and variable listing are printed for the first year of weapon system A. Such listings are always printed on separate pages. Otherwise, the lines of output remain together for each weapon system.

Each value listed in the weapon system output is rounded to the nearest whole number except for the numbers of aircraft and simulators required (see, for example, Fig. 4). Values for these items are printed to two decimal places. As explained previously and noted on the output pages, all costs shown in the weapon system output are in thousands of dollars except for the operating cost per graduate, which is in dollars.

As an example of the use of the Common Dump listing, suppose that one is interested in obtaining the value of the instructor flying hours per student for all aircraft types in the long course. On the fifth page of Appendix A the address of this variable is listed as 171, and in the Common Dump (Fig. 5) its value is seen to be 42.5. Similarly, the value of the total ground school classroom hours (address 184) is listed as 4676.496. These values are also obtained, of course, from the variable listing, Fig. 9.

Finally, it should be noted that the page numbers start with 1 at the beginning of each run. This is seen in Figs. 4 and 15. Otherwise, the pages are numbered consecutively within a run.

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*Figures 4-17 represent demonstration runs. Neither the inputs nor the outputs of those runs are intended to be used for any other purposes. If any results from the APT program are to be used for official purposes, the inputs should be obtained from official sources.

ADVANCED PILOT TRAINING COST MODEL TEST RUN NO. 1 PAGE 1

WEAPON SYSTEM A
(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

YEAR	NO. GRAD	AVG STUD. LOAD	PERM PARTY PERS	NO. TYPE 1 ACFT REQ	NO. TYPE 2 ACFT REQ	NO. TYPE 3 ACFT REQ	NO. SIMS REQ	INV COST	FLYING HOUR COST	PAY	OTHER OPER COST	TOTAL OPER COST	OPER PLUS INV COST	OPER COST PER GRAD ($)
1967	396	107	1206	29.09	0.0	0.0	1.72	0	11761	8763	5953	26477	26477	66861

Fig. 4--Run 1 sample output (weapon system A): standard printout, 1967

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

COMMON DUMP

1	2	3	4	5	6	7	8	9	10	ADDRESSES
1.000	1.000	200.000	40.000	60.000	100.000	14.000	14.000	0.990	0.990	1- 10
103.000	0.0	0.0	103.000	0.0	0.0	27.000	27.000	188.000	188.000	11- 20
2.000	0.0	0.0	2.000	0.0	0.0	85.000	0.0	0.0	85.000	21- 30
0.0	0.0	425.000	600.000	600.000	300.000	300.000	2.000	16.000	16.000	31- 40
6.000	6.000	0.700	0.700	1.100	0.0	0.050	0.0	0.0	0.460	41- 50
0.0	0.0	3120.000	2600.000	740.000	0.0	0.0	30.000	0.0	0.0	51- 60
3.000	2.000	2.000	0.125	3.000	0.100	8.000	0.050	0.0	0.0	6 - 70
0.012	2.000	5.000	0.140	0.0	0.550	1.000	0.0	0.100	0.900	71- 80
0.500	0.500	0.240	0.740	0.020	0.960	0.200	0.800	0.210	0.750	81- 90
0.060	0.710	0.750	20.000	6500.000	0.0	0.0	900.000	80.000	0.050	91- 100
100.000	650.000	0.0	0.0	371.000	0.0	0.0	167.000	0.0	0.0	101- 110
10.000	10.000	500.000	8.000	0.0	0.0	1.000	0.0	0.0	1.000	111- 120
1967.000	100.000	500.000	800.000	1000.000	400.000	10543.000	16000.000	13500.000	4800.000	121- 130
6763.000	25.000	407.000	810.000	0.700	15.000	750.000	150.000	446.000	0.150	131- 140
1.000	0.0	0.0	0.0	2.000	2.000	1.000	1.000	1.000	1967.000	141- 150
400.000	200.000	200.000	198.000	198.000	396.000	199.000	199.000	53.577	53.577	151- 160
107.154	10248.492	0.0	0.0	10248.492	0.0	0.0	20496.984	0.0	0.0	161- 170
42.500	42.500	8457.492	8457.492	16914.985	2686.498	2686.498	5372.996	1193.999	1193.999	171- 180
2387.999	2338.249	2338.249	4676.496	1634.774	1636.774	3273.548	701.475	701.475	1402.949	181- 190
1024.849	0.0	0.0	21521.832	0.0	0.0	9900.039	0.0	0.0	29.763	191- 200
0.0	0.0	3.000	2.000	29.084	0.0	0.0	1.722	0.918	0.0	201- 210
0.0	0.0	0.0	0.0	0.0	0.0	0.039	0.0	0.0	3761.097	211- 220
39.800	8.955	3.980	10.912	4.676	68.323	10.540	13.715	8.000	100.579	221- 230
495.002	0.0	0.0	495.002	45.133	4.000	49.133	644.714	95.260	847.127	231- 240
465.920	1313.047	1205.893	148.363	936.384	1084.746	121.146	126.456	21.907	0.0	241- 250
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	251- 260
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	261- 270
0.0	0.0	6435.023	3672.914	1653.306	11761.238	1.990	1.990	1129.722	2023.291	271- 280
295.743	4494.641	6813.672	7943.391	819.313	8762.703	200.000	30.147	534.410	1063.567	281- 290
9.644	4.000	0.0	19.696	37.091	140.458	537.828	5953.117	26477.059	66861.250	291- 300
26477.059	0.237	0.0	0.0	3372.299	0.0	0.0	3372.299	0.0	0.0	301- 310

Fig. 5--Run 1 sample output (weapon system A): Common Dump. 1967

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

1	WEAPON SYSTEM NUMBER	1.00000
2	YEAR NUMBER (1., 2., 3., . . . ETC.)	1.00000
3	ENTERING STUDENTS FROM SIMILAR AIRCRAFT	200.00000
4	ENTERING STUDENTS FROM DISSIMILAR AIRCRAFT	40.00000
5	ENTERING STUDENTS FROM DESK JOBS	60.00000
6	ENTERING STUDENTS FROM UNDERGRADUATE PILOT TRAINING (UPT)	100.00000
7	LENGTH OF LONG COURSE (WEEKS)	14.00000
8	LENGTH OF SHORT COURSE (WEEKS)	14.00000
9	FRACTION OF ENTERING STUDENTS WHO GRADUATE--LONG COURSE	0.95000
10	FRACTION OF ENTERING STUDENTS WHO GRADUATE--SHORT COURSE	0.99000
11	HOURS EACH STUDENT REQUIRED TO FLY--TYPE 1 AIRCRAFT, LONG COURSE	103.00000
12	HOURS EACH STUDENT REQUIRED TO FLY--TYPE 2 AIRCRAFT, LONG COURSE	0.0
13	HOURS EACH STUDENT REQUIRED TO FLY--TYPE 3 AIRCRAFT, LONG COURSE	0.0
14	HOURS EACH STUDENT REQUIRED TO FLY--TYPE 1, SHORT COURSE	103.00000
15	HOURS EACH STUDENT REQUIRED TO FLY--TYPE 2, SHORT COURSE	0.0
16	HOURS EACH STUDENT REQUIRED TO FLY--TYPE 3, SHORT COURSE	0.0
17	SIMULATOR HOURS REQUIRED PER STUDENT--LONG COURSE	27.00000
18	SIMULATOR HOURS REQUIRED PER STUDENT--SHORT COURSE	27.00000
19	HOURS STUDENT REQUIRED TO ATTEND GROUND SCHOOL (GS)--LONG COURSE	188.00000
20	HOURS STUDENT REQUIRED TO ATTEND GROUND SCHOOL (GS)--SHORT COURSE	188.00000
21	AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 1, LONG COURSE	2.00000
22	AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 2, LONG COURSE	0.0
23	AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 3, LONG COURSE	0.0
24	AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 1, SHORT COURSE	2.00000
25	AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 2, SHORT COURSE	0.0
26	AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 3, SHORT COURSE	0.0
27	HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 1, LONG COURSE	85.00000
28	HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 2, LONG COURSE	0.0
29	HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 3, LONG COURSE	0.0
30	HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 1, SHORT COURSE	85.00000
31	HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 2, SHORT COURSE	0.0
32	HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 3, SHORT COURSE	0.0
33	MAXIMUM HOURS PER YEAR INSTRUCTOR FLIES WITH STUDENTS	425.00000
34	MAXIMUM SIMULATOR HOURS PER YEAR INSTRUCTOR SUPERVISES	600.00000
35	MAXIMUM TRAINER HOURS PER YEAR INSTRUCTOR SUPERVISES	600.00000
36	MAXIMUM GS HOURS PER YEAR CCTS INSTRUCTOR TEACHES	300.00000
37	MAXIMUM GS HOURS PER YEAR FTO INSTRUCTOR TEACHES	300.00000
38	AVG NO. STUDENT PILOTS ON SIMULATOR AT ONE TIME	2.00000
39	AVG NO. STUDENT PILOTS IN GS CLASSROOM AT ONE TIME--LONG COURSE	16.00000
40	AVG NO. STUDENT PILOTS IN GS CLASSROOM AT ONE TIME--SHORT COURSE	16.00000
41	TRAINER HOURS REQUIRED PER STUDENT--LONG COURSE	6.00000
42	TRAINER HOURS REQUIRED PER STUDENT--SHORT COURSE	6.00000
43	FRACTION OF GS HOURS TAUGHT BY CCTS INSTRUCTORS--LONG COURSE	0.70000
44	FRACTION OF GS HOURS TAUGHT BY CCTS INSTRUCTORS--SHORT COURSE	0.70000
45	AIRCRAFT ATTRITION PER 100000 FLYING HOURS--TYPE 1	1.10000
46	AIRCRAFT ATTRITION PER 100000 FLYING HOURS--TYPE 2 (SEE 144)	0.0
47	OTHER FH CHARGED TO CREW TRNG (FRACT. STUD.*SEP. INST. FH)--TYPE 1	0.65000
48	OTHER FH CHARGED TO CREW TRAINING (FRACTION STUDENT FH)--TYPE 2	0.0
49	OTHER FH CHARGED TO CREW TRAINING (FRACTION STUDENT FH)--TYPE 3	0.0
50	FRACTION OF TOTAL FH OR COST ALLOCATED TO PILOT TRAINING--TYPE 1	0.46000
51	FRACTION OF TOTAL FH OR COST ALLOCATED TO PILOT TRAINING--TYPE 2	0.0
52	FRACTION OF TOTAL FH OR COST ALLOCATED TO PILOT TRAINING--TYPE 3	0.0
53	TRAINING HOURS AVAILABLE PER YEAR ON ONE SIMULATOR	3120.00000

Fig. 6--Run 1 sample output (weapon system A):
Variable listing, 1967, F(001)-F(053)

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

54	TRAINING HOURS AVAILABLE PER YEAR ON ONE TRAINER	2600.00000
55	AVAILABLE FLYING HOURS PER YEAR--TYPE 1	740.00000
56	AVAILABLE FLYING HOURS PER YEAR--TYPE 2	0.0
57	AVAILABLE FLYING HOURS PER YEAR--TYPE 3	0.0
58	AIRCRAFT AVAILABLE AT BEGINNING OF FIRST YEAR--TYPE 1	30.00000
59	AIRCRAFT AVAILABLE AT BEGINNING OF FIRST YEAR--TYPE 2	0.0
60	AIRCRAFT AVAILABLE AT BEGINNING OF FIRST YEAR--TYPE 3	0.0
61	SIMULATORS AVAILABLE AT BEGINNING OF FIRST YEAR	3.00000
62	TRAINERS AVAILABLE AT BEGINNING OF FIRST YEAR	2.00000
63	FIXED NUMBER OF INSTRUCTOR-SUPERV+ADMIN--SQDN LEVEL	2.00000
64	VARIABLE NUMBER OF INSTRUCTOR-SUPERV+ADMIN (PER INST.)--SQDN LEVEL	0.12500
65	FIXED NUMBER OF ACADEMIC-PROGRAM SUPERVISORS--SQUADRON LEVEL	3.00000
66	VARIABLE NO. ACAD-PROG SUPERV, PER STUD. IN STUD. LOAD--SQDN LEVEL	0.10000
67	TOTAL STANDARD-EVALUATION PERSONNEL REQUIRED	8.00000
68	AIRCRAFT MAINTENANCE PERSONNEL REQUIRED PER FLYING HOUR--TYPE 1	0.05000
69	AIRCRAFT MAINTENANCE PERSONNEL REQUIRED PER FLYING HOUR--TYPE 2	0.0
70	AIRCRAFT MAINTENANCE PERSONNEL REQUIRED PER FLYING HOUR--TYPE 3	0.0
71	SIMULATOR OPER+MTC PERS AUTHORIZED PER SIMULATOR OR PER SIM HOUR	0.01200
72	TRAINER OPER+MTC PERS AUTHORIZED PER TRAINER	2.00000
73	FIXED NUMBER OF ADMINISTRATIVE PERSONNEL--WING LEVEL	5.00000
74	VARIABLE NO. ADMIN PERS--WING LEVEL (PER OPER+MTC PERSONNEL)	0.14000
75	FIXED NUMBER OF SUPPORT PERSONNEL	0.0
76	VARIABLE NO. SUPPORT PERS (PER TOTAL STUDENT LOAD+OPER+MTC+ADMIN)	0.55000
77	FRACTION OF GS CCTS INSTRUCTORS WHO ARE OFFICERS	1.00000
78	FRACTION OF GS CCTS INSTRUCTORS WHO ARE AIRMEN	0.0
79	FRACTION OF GS FTD INSTRUCTORS WHO ARE OFFICERS	0.10000
80	FRACTION OF GS FTD INSTRUCTORS WHO ARE AIRMEN	0.90000
81	FRACTION OF INSTRUCTOR-SUPERV+ADMIN (SQDN LEVEL) WHO ARE OFFICERS	0.50000
82	FRACTION OF INSTRUCTOR-SUPERV+ADMIN (SQDN LEVEL) WHO ARE AIRMEN	0.50000
83	FRACTION OF ACAD-PROGRM SUPERV+ADMIN (SQDN LEVEL) WHO ARE OFFICERS	0.24000
84	FRACTION OF ACAD-PROGRM SUPERV+ADMIN (SQDN LEVEL) WHO ARE AIRMEN	0.76000
85	FRACTION OF AIRCRAFT MTC PERSONNEL WHO ARE OFFICERS	0.02000
86	FRACTION OF AIRCRAFT MTC PERSONNEL WHO ARE AIRMEN	0.98000
87	FRACTION OF SIMULATOR AND TRAINER MTC+OPER PERS WHO ARE OFFICERS	0.20000
88	FRACTION OF SIMULATOR AND TRAINER MTC+OPER PERS WHO ARE AIRMEN	0.80000
89	FRACTION OF ADMIN PERSONNEL (WING LEVEL) WHO ARE OFFICERS	0.21000
90	FRACTION OF ADMIN PERSONNEL (WING LEVEL) WHO ARE AIRMEN	0.79000
91	FRACTION OF SUPPORT PERSONNEL WHO ARE OFFICERS	0.06000
92	FRACTION OF SUPPORT PERSONNEL WHO ARE AIRMEN	0.71000
93	FRACTION OF OFFICERS WHO ARE RATED	0.75000
94	MIN INCREASE IN STUDENT LOAD BEFORE I.I. TRNG EQUIP+SPARES JUSTIF.	20.00000
95	I.I. COST PER AIRCRAFT--TYPE 1	6500.00000
96	I.I. COST PER AIRCRAFT--TYPE 2	0.0
97	I.I. COST PER AIRCRAFT--TYPE 3	0.0
98	I.I. COST PER SIMULATOR	900.00000
99	I.I. COST PER TRAINER	80.00000
100	FRACTION OF I.I. SIMULATOR COST FOR SIMULATOR SPARES COST	0.05000
101	I.I. COST FOR TRNG EQUIP+SPARES PER INCREASE IN STUDENT LOAD ($)	100.00000
102	OPERATING COST PER FLYING HOUR FOR DEPOT MTC--TYPE 1 ($)	650.00000
103	OPERATING COST PER FLYING HOUR FOR DEPOT MTC--TYPE 2 ($)	0.0
104	OPERATING COST PER FLYING HOUR FOR DEPOT MTC--TYPE 3 ($)	0.0
105	OPERATING COST PER FLYING HOUR FOR POL--TYPE 1 ($)	371.00000
106	OPERATING COST PER FLYING HOUR FOR POL--TYPE 2 ($)	0.0

Fig. 7--Run 1 sample output (weapon system A):
Variable listing, 1967, F(054)-F(106)

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

107	OPERATING COST PER FLYING HOUR FOR POL--TYPE 3 ($)	0.0
108	OPERATING COST PER FLYING HOUR FOR MATERIAL--TYPE 1 ($)	167.00000
109	OPERATING COST PER FLYING HOUR FOR MATERIAL--TYPE 2 ($)	0.0
110	OPERATING COST PER FLYING HOUR FOR MATERIAL--TYPE 3 ($)	0.0
111	OPERATING COST PER STUDENT FOR MUNITIONS--LONG COURSE ($)	10.00000
112	OPERATING COST PER STUDENT FOR MUNITIONS--SHORT COURSE ($)	10.00000
113	OPERATING COST PER STUDENT FOR AVERAGE TDY/PCS ($)	500.00000
114	OPERATING COST PER SIM PER YR FOR SIM MTC--MATERIAL, SERVICES	8.00000
115	OPERATING COST PER YEAR FOR TARGET RENTAL	0.0
116	R AND D COST	0.0
117	DUMP PRINTOUT DESIGNATOR (0./1.--DO NOT/DO PRINT DUMP)	1.00000
118	ZERO-OUTPUT DESIGNATOR (0./1.--DO NOT/DO ZERO OUTPUT EXCEPT GRADS)	0.0
119	CLEAR DESIGNATOR (0./1.--DO NOT/DO ZERO OUT ALL F VARIABLES	0.0
120	WEAPON SYSTEM VARIABLE-LISTING PRINT DESIGNATOR	1.00000
121	BEGINNING YEAR (E.G., 1967)	1967.00000
122	MIN INCREASE IN PERM PARTY BEFORE I.I. EQUIP+SUPPLIES JUSTIFIED	100.00000
123	I.I. COST FOR BASE SUPPORT EQUIP+SPARES PER PERM PARTY INCREASE($)	500.00000
124	I.I. COST FOR BASE SUPPLY INVENTORY PER PERM PARTY INCREASE ($)	800.00000
125	I.I. COST FOR PERM-PARTY-INCREASE TRAINING OFF BASE ($)	1000.00000
126	I.I. COST FOR PERM-PARTY-INCREASE TRAVEL ($)	400.00000
127	OPER. COST PER YEAR FOR AVG PAY OF STUDENT ($)	10543.00000
128	OPER. COST PER YEAR FOR AVG PAY OF PERM PARTY RATED OFFICER ($)	16000.00000
129	OPER. COST PER YEAR FOR AVG PAY OF PERM PARTY NONRATED OFFICER ($)	13500.00000
130	OPER. COST PER YEAR FOR AVG PAY OF PERM PARTY AIRMAN ($)	4800.00000
131	OPER. COST PER YEAR FOR AVG PAY OF CIVILIAN ($)	6763.00000
132	OPER. COST PER YEAR FOR AVG TDY OF PERM PARTY ($)	25.00000
133	OPER. COST PER YEAR FOR SERVICES--AVG PER PERSON ON BASE ($)	407.00000
134	OPER. COST PER YEAR FOR SUPPLIES+EQUIP PER PERSON ON BASE ($)	810.00000
135	FRACTION OF SIMULATOR HOURS OR COSTS ALLOCATED TO PILOT TRAINING	.70000
136	OPER. COST PER YEAR FOR SUPPORT ACFT--AVG PER PERSON ON BASE ($)	15.00000
137	OPER. COST PER YEAR FOR PERM PARTY OFFICER TRAINING OFF BASE ($)	250.00000
138	OPER. COST PER YEAR FOR PERM PARTY AIRMAN TRAINING OFF BASE ($)	150.00000
139	OPER. COST PER YEAR FOR AVERAGE PCS PER PERM PARTY PERSON ($)	446.00000
140	FRACTION OF I.I. AIRCRAFT COST FOR AIRCRAFT SPARES COST	0.15000
141	VARIABLE-LISTING READ DESIGNATOR (0./1.--DO NOT/DO READ VARIABLES)	1.00000
142	INSTRUCTOR LEAD/TCW FLYING HOURS PER STUDENT--TYPE 1, LONG COURSE	0.0
143	INSTRUCTOR LEAD/TCW FLYING HOURS PER STUDENT--TYPE 1, SHORT COURSE	0.0
144	AIRCRAFT ATTRITION PER 100000 FLYING HOURS--TYPE 3 (SEE 045, 046)	0.0
145	OPER. COST PER YEAR FOR TRAINER MTC PER TRNR--MATERIAL, SERVICES	2.00000
146	PAGE NUMBER	2.00000
147	YEAR COUNTER	1.00000
148	END-OF-DATA DESIGNATOR	1.00000
149	PASS COUNTER	1.00000
150	CURRENT YEAR	1967.00000
151	TOTAL ENTERING STUDENTS	400.00000
152	TOTAL ENTERING STUDENTS--LONG COURSE	200.00000
153	TOTAL ENTERING STUDENTS--SHORT COURSE	200.00000
154	TOTAL GRADUATES--LONG COURSE	197.99998
155	TOTAL GRADUATES--SHORT COURSE	197.99998
156	TOTAL GRADUATES	395.99576
157	AVERAGE NUMBER OF STUDENTS PER YEAR--LONG COURSE	195.99988
158	AVERAGE NUMBER OF STUDENTS PER YEAR--SHORT COURSE	158.99988
159	AVERAGE STUDENT LOAD FOR LONG COURSE	53.57689

Fig. 8--Run 1 sample output (weapon system A):
Variable listing, 1967, F(107)-F(159)

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

160	AVERAGE STUDENT LOAD FOR SHORT COURSE	53.57689
161	TOTAL AVERAGE STUDENT LOAD	107.15378
162	TOTAL STUDENT FLYING HOURS--TYPE 1, LONG COURSE	10248.49219
163	TOTAL STUDENT FLYING HOURS--TYPE 2, LONG COURSE	0.0
164	TOTAL STUDENT FLYING HOURS--TYPE 3, LONG COURSE	0.0
165	TOTAL STUDENT FLYING HOURS--TYPE 1, SHORT COURSE	10248.49219
166	TOTAL STUDENT FLYING HOURS--TYPE 2, SHORT COURSE	0.0
167	TOTAL STUDENT FLYING HOURS--TYPE 3, SHORT COURSE	0.0
168	TOTAL STUDENT FLYING HOURS--TYPE 1	20496.98438
169	TOTAL STUDENT FLYING HOURS--TYPE 2	0.0
170	TOTAL STUDENT FLYING HOURS--TYPE 3	0.0
171	INSTRUCTOR FH PER STUDENT--ALL AIRCRAFT TYPES, LONG COURSE	42.50000
172	INSTRUCTOR FH PER STUDENT--ALL AIRCRAFT TYPES, SHORT COURSE	42.50000
173	TOTAL HOURS INSTRUCTOR FLIES WITH STUDENTS--LONG COURSE	8457.49219
174	TOTAL HOURS INSTRUCTOR FLIES WITH STUDENTS--SHORT COURSE	8457.49219
175	TOTAL HOURS INSTRUCTOR FLIES WITH STUDENTS	16914.98438
176	TOTAL STUDENT SIMULATOR HOURS--LONG COURSE	2686.49805
177	TOTAL STUDENT SIMULATOR HOURS--SHORT COURSE	2686.49805
178	TOTAL STUDENT SIMULATOR HOURS	5372.99609
179	TOTAL STUDENT TRAINER HOURS--LONG COURSE	1193.99927
180	TOTAL STUDENT TRAINER HOURS--SHORT COURSE	1193.99927
181	TOTAL STUDENT TRAINER HOURS	2387.99854
182	TOTAL GROUND-SCHOOL CLASSROOM HOURS--LONG COURSE	2338.24854
183	TOTAL GROUND-SCHOOL CLASSROOM HOURS--SHORT COURSE	2338.24854
184	TOTAL GROUND-SCHOOL CLASSROOM HOURS	4676.49609
185	TOTAL GS CLASSROOM HOURS TAUGHT BY CCTS INSTRUCTORS--LONG COURSE	1636.77393
186	TOTAL GS CLASSROOM HOURS TAUGHT BY CCTS INSTRUCTORS--SHORT COURSE	1636.77393
187	TOTAL GS CLASSROOM HOURS TAUGHT BY CCTS INSTRUCTORS	3273.54785
188	TOTAL GS CLASSROOM HOURS TAUGHT BY FTD INSTRUCTORS--LONG COURSE	701.47461
189	TOTAL GS CLASSROOM HOURS TAUGHT BY FTD INSTRUCTORS--SHORT COURSE	701.47461
190	TOTAL GS CLASSROOM HOURS TAUGHT BY FTD INSTRUCTORS	1402.94922
191	OTHER FLYING HOURS--TYPE 1	1024.84512
192	OTHER FLYING HOURS--TYPE 2	0.0
193	OTHER FLYING HOURS--TYPE 3	0.0
194	TOTAL FLYING HOURS--TYPE 1	21521.83203
195	TOTAL FLYING HOURS--TYPE 2	0.0
196	TOTAL FLYING HOURS--TYPE 3	0.0
197	FLYING HOURS CHARGED TO PILOT TRAINING--TYPE 1	9900.03906
198	FLYING HOURS CHARGED TO PILOT TRAINING--TYPE 2	0.0
199	FLYING HOURS CHARGED TO PILOT TRAINING--TYPE 3	0.0
200	CURRENT INVENTORY--TYPE 1	29.76326
201	CURRENT INVENTORY--TYPE 2	0.0
202	CURRENT INVENTORY--TYPE 3	0.0
203	CURRENT INVENTORY--SIMULATORS	3.00000
204	CURRENT INVENTORY--TRAINERS	2.00000
205	AIRCRAFT REQUIRED--TYPE 1	29.08354
206	AIRCRAFT REQUIRED--TYPE 2	0.0
207	AIRCRAFT REQUIRED--TYPE 3	0.0
208	SIMULATORS REQUIRED	1.72211
209	TRAINERS REQUIRED	0.91846
210	AIRCRAFT TO BE PROCURED--TYPE 1	0.0
211	AIRCRAFT TO BE PROCURED--TYPE 2	0.0
212	AIRCRAFT TO BE PROCURED--TYPE 3	0.0

Fig. 9--Run 1 sample output (weapon system A): Variable listing, 196/, F(160)-F(212)

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

213	SIMULATORS TO BE PROCURED	0.0
214	TRAINERS TO BE PROCURED	0.0
215	TOTAL INSTRUCTOR LEAD/TOW FLYING HOURS--TYPE 1, LONG COURSE	0.0
216	TOTAL INSTRUCTOR LEAD/TOW FLYING HOURS--TYPE 1, SHORT COURSE	0.0
217	RECURRING INVESTMENT COST FACTOR--TYPE 1 (WEAPON SYSTEM INPUT)	0.03878
218	RECURRING INVESTMENT COST FACTOR--TYPE 2 (WEAPON SYSTEM INPUT)	0.0
219	RECURRING INVESTMENT COST FACTOR--TYPE 3 (WEAPON SYSTEM INPUT)	0.0
220	SIMULATOR HOURS CHARGED TO PILOT TRAINING	3761.05717
221	TOTAL FLYING INSTRUCTORS REQUIRED	39.75556
222	TOTAL SIMULATOR INSTRUCTORS REQUIRED	8.95499
223	TOTAL TRAINER INSTRUCTORS REQUIRED	3.58000
224	TOTAL GROUND-SCHOOL CCTS INSTRUCTORS REQUIRED	10.91183
225	TOTAL GROUND-SCHOOL FTD INSTRUCTORS REQUIRED	4.67650
226	TOTAL INSTRUCTORS REQUIRED	68.32324
227	TOTAL INSTRUCTOR SUPERVISORS AND ADMIN PERS REQUIRED--SQDN LEVEL	10.54041
228	TOTAL ACAD-PROGRAM SUPERVISORS AND ADMIN PERS REQUIRED--SQDN LEVEL	13.71537
229	TOTAL STANDARD-EVALUATION PERSONNEL REQUIRED	8.00000
230	TOTAL NONSTUDENT OPERATIONS PERSONNEL	100.57901
231	TOTAL AIRCRAFT MAINTENANCE PERSONNEL--TYPE 1	495.00171
232	TOTAL AIRCRAFT MAINTENANCE PERSONNEL--TYPE 2	0.0
233	TOTAL AIRCRAFT MAINTENANCE PERSONNEL--TYPE 3	0.0
234	TOTAL AIRCRAFT MAINTENANCE PERSONNEL	495.00171
235	TOTAL SIMULATOR MAINTENANCE AND OPERATING PERSONNEL	45.13315
236	TOTAL TRAINER MAINTENANCE AND OPERATING PERSONNEL	4.00000
237	TOTAL SIMULATOR AND TRAINER MAINTENANCE AND OPERATING PERSONNEL	49.13315
238	TOTAL OPERATIONS AND MAINTENANCE PERSONNEL	644.71367
239	TOTAL ADMINISTRATIVE PERSONNEL (WING LEVEL)	95.25985
240	TOTAL STUDENT LOAD + OPERATIONS + MTC + ADMINISTRATIVE PERSONNEL	847.12695
241	TOTAL SUPPORT PERSONNEL	465.51968
242	TOTAL PERSONNEL CHARGED TO PILOT TRAINING, INCLUDING STUDENTS	1313.04663
243	TOTAL PERMANENT PARTY PERSONNEL	1205.89282
244	TOTAL PERMANENT PARTY OFFICERS	148.36266
245	TOTAL PERMANENT PARTY AIRMEN	936.38379
246	TOTAL PERMANENT PARTY MILITARY PERSONNEL	1084.74634
247	TOTAL CIVILIANS	121.14648
248	TOTAL PERMANENT PARTY RATED OFFICERS	126.45572
249	TOTAL PERMANENT PARTY NONRATED OFFICERS	21.90694
250	CHANGE IN STUDENT LOAD	0.0
251	CHANGE IN TOTAL PERSONNEL, INCLUDING STUDENTS	0.0
252	CHANGE IN TOTAL PERMANENT PARTY PERSONNEL	0.0
253	CHANGE IN TOTAL PERMANENT PARTY MILITARY PERSONNEL	0.0
254	CHANGE IN PERM. PARTY LESS CHANGE DUE TO ALLOC. FRACTION VARIATION	0.0
255	ADJUSTMENT TO FLTM. EFFECT ON I.I. COST OF CHANGE IN ALLOC. FRACT.	0.0
256	CUMULATIVE CHANGE IN STUDENT LOAD UNTIL THRESHOLD IS REACHED	0.0
257	CUMULATIVE CHANGE IN ADJ. PERM PARTY UNTIL THRESHOLD IS REACHED	0.0
258	I.I. COST OF AIRCRAFT TO BE PROCURED--TYPE 1	0.0
259	I.I. COST OF AIRCRAFT TO BE PROCURED--TYPE 2	0.0
260	I.I. COST OF AIRCRAFT TO BE PROCURED--TYPE 3	0.0
261	I.I. COST OF SIMULATORS TO BE PROCURED	0.0
262	I.I. COST OF TRAINERS TO BE PROCURED	0.0
263	I.I. COST OF AIRCRAFT SPARES--TYPE 1	0.0
264	I.I. COST OF AIRCRAFT SPARES--TYPE 2	0.0
265	I.I. COST OF AIRCRAFT SPARES--TYPE 3	0.0

Fig. 10--Run 1 sample output (weapon system A): Variable listing, 1967, F(213)-F(265)

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

266	I.I. COST OF SIMULATOR SPARES	0.0
267	I.I. COST OF TRAINING EQUIP AND SPARES FOR STUDENT LOAD INCREASE	0.0
268	I.I. COST OF BASE SUPPORT EQUIP+SPARES FOR PERM PARTY INCREASE	0.0
269	I.I. COST OF SUPPLIES FOR PERMANENT PARTY INCREASE	0.0
270	I.I. COST OF TRAINING FOR PERMANENT PARTY INCREASE	0.0
271	I.I. COST OF TRAVEL FOR PERMANENT PARTY INCREASE (PCS)	0.0
272	TOTAL INCREASE IN I.I. COST	0.0
273	OPERATING COST OF DEPOT MAINTENANCE	6435.02344
274	OPERATING COST OF POL	3672.91357
275	OPERATING COST OF MATERIAL	1653.30566
276	OPERATING COST OF TOTAL FLYING HOURS	11761.23828
277	OPERATING COST OF MUNITIONS--LONG COURSE	1.99000
278	OPERATING COST OF MUNITIONS--SHORT COURSE	1.99000
279	OPERATING COST OF STUDENT PAY	1129.72168
280	OPERATING COST OF RATED OFFICER PAY	2023.29077
281	OPERATING COST OF NONRATED OFFICER PAY	295.74341
282	OPERATING COST OF AIRMEN PAY	4494.64063
283	OPERATING COST OF TOTAL PERMANENT PARTY MILITARY PAY	6813.67188
284	OPERATING COST OF TOTAL MILITARY PAY, INCLUDING STUDENTS	7943.39063
285	OPERATING COST OF CIVILIAN PAY	819.31348
286	OPERATING COST OF TOTAL PAY--MILITARY PLUS CIVILIANS	8762.70313
287	OPERATING COST OF STUDENT TOY/PCS	159.99998
288	OPERATING COST OF ALL PERMANENT PARTY PERSONNEL TOY	30.14731
289	OPERATING COST OF SERVICES	534.40967
290	OPERATING COST OF SUPPLIES AND EQUIPMENT	1063.56689
291	OPERATING COST OF SIMULATOR MTC, MATERIAL, AND SERVICES	9.64384
292	OPERATING COST OF TRAINER MTC, MATERIAL, AND SERVICES	4.00000
293	OPERATING COST OF TARGET RENTAL	0.0
294	OPERATING COST OF SUPPORT AIRCRAFT	19.69565
295	OPERATING COST OF OFFICERS TRAINING	37.09065
296	OPERATING COST OF AIRMEN TRAINING	140.45755
297	OPERATING COST OF PERMANENT CHANGE OF STATION	537.82813
298	TOTAL OTHER OPERATING COST, INCLUDING RECURRING INVESTMENT	5953.11719
299	TOTAL OPERATING COST, INCLUDING RECURRING INVESTMENT	26477.05859
300	OPERATING COST PER GRADUATE (*)	66861.25000
301	TOTAL SYSTEM COST (INVESTMENT + OPERATING), EXCLUDING R AND D	26477.05859
302	AIRCRAFT LOST TO ATTRITION--TYPE 1	0.23674
303	AIRCRAFT LOST TO ATTRITION--TYPE 2	0.0
304	AIRCRAFT LOST TO ATTRITION--TYPE 3	0.0
305	RECURRING INVESTMENT COST (OPERATING COST)--TYPE 1	3372.29932
306	RECURRING INVESTMENT COST (OPERATING COST)--TYPE 2	0.0
307	RECURRING INVESTMENT COST (OPERATING COST)--TYPE 3	0.0
308	TOTAL AIRCRAFT RECURRING INVESTMENT COST (OPERATING COST)	3372.29932
309	NOT USED	0.0
310	NOT USED	0.0

Fig. 11--Run ' Sample output (weapon system A): Variable listing, 1967, F(266)-F(310)

WEAPON SYSTEM A
(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

YEAR	NO. GRAD	AVG STUD. LOAD	PERM PARTY PERS	NO. TYPE 1 ACFT REQ	NO. TYPE 2 ACFT REQ	NO. TYPE 3 ACFT REQ	NO. SIMS REQ	INV COST	FLYING HOUR COST	PAY	OTHER OPER COST	TOTAL OPER COST	OPER PLUS INV COST	OPER COST PER GRAD ($)
1968	356	96	1089	26.18	0.0	0.0	1.55	0	10585	7919	5365	23870	23870	66975
1969	436	118	1323	31.99	0.0	0.0	1.89	9770	12937	9606	6541	29084	38855	66769

R AND D COST = 0

Fig. 12--Run 1 sample output (weapon system A): standard printout, 1968-1969

(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

YEAR	NO. GRAD	AVG STUD. LOAD	PERM PARTY PERS	NO. TYPE 1 ACFT REQ	NO. TYPE 2 ACFT REQ	NO. TYPE 3 ACFT REQ	NO. SIMS REQ	INV COST	FLYING HOUR COST	PAY	OTHER OPER COST	TOTAL OPER COST	OPER PLUS INV COST	OPER COST PER GRAD ($)
1967	297	69	601	18.61	0.0	0.0	1.15	0	3426	4667	2536	10629	10629	35787
1968	267	62	544	16.75	0.0	0.0	1.03	0	3095	4228	2289	9600	9600	35915
1969	327	76	657	20.47	0.0	0.0	1.26	159	3779	5106	2783	11657	11816	35682

R AND D COST = 0

Fig. 13--Run 1 sample output (weapon system B): standard printout, 1967-1969

WEAPON SYSTEM C
(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

YEAR	NO. GRAD	AVG STUD. LOAD	PERM PARTY PERS	NO. TYPE 1 ACFT REQ	NO. TYPE 2 ACFT REQ	NO. TYPE 3 ACFT REQ	NO. SIMS REQ	INV COST	FLYING HOUR COST	PAY	OTHER OPER COST	TOTAL OPER COST	OPER PLUS INV COST	OPER COST PER GRAD ($)
1967	177	88	3111	90.61	1.15	2.30	1.38	0	21425	19059	13775	54268	54268	306359
1968	160	79	2807	81.65	1..	2.61	1.24	0	19306	17207	12619	48932	48932	306552
1969	195	96	3416	99.57	1.27	3.18	1.52	45214	23544	20930	15131	59605	104819	306201

R AND D COST = 0

Fig. 14--Run 1 sample output (weapon system C): standard printout, 1967-1969

ADVANCED PILOT TRAINING COST MODEL TEST RUN NO. 2 PAGE 1

WEAPON SYSTEM D
(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

YEAR	NO. GRAD	AVG STUD. LOAD	PERM PARTY PERS	NO. TYPE 1 ACFT REQ	NO. TYPE 2 ACFT REQ	NO. TYPE 3 ACFT REQ	NO. SIMS REQ	INV COST	FLYING HOUR COST	PAY	OTHER OPER COST	TOTAL OPER COST	OPER PLUS INV COST	OPER COST PER GRAD ($)
1967	396	107	2233	29.08	0.0	0.0	1.72	0	25963	14420	11805	51792	51792	130789
1968	356	96	2013	26.18	0.0	0.0	1.55	0	23011	13011	10632	46654	46654	130902

R AND D COST = 0

Fig. 15--Run 2 sample output (weapon system D): standard printout, 1967-1968

WEAPON SYSTEM E
(ALL OUTPUT COSTS EXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)

YEAR	NO. GRAD	AVG STUD. LOAD	PERM PARTY PERS	NO. TYPE 1 ACFT REQ	NO. TYPE 2 ACFT REQ	NO. TYPE 3 ACFT REQ	NO. SIMS REQ	INV COST	FLYING HOUR COST	PAY	OTHER OPER COST	TOTAL OPER COST	OPER PLUS INV COST	OPER COST PER GRAD ($)
1967	297	69	913	18.61	0.0	0.0	1.15	0	6229	6389	4086	16704	16704	56242
1968	267	62	825	16.75	0.0	0.0	1.03	0	5606	5778	3684	15068	15068	56371
1969	327	76	1001	20.47	0.0	0.0	1.26	247	6852	7000	4488	18340	18587	56137

R AND D COST = 0

Fig. 16--Run 2 sample output (weapon system E): standard printout, 1967-1969

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END OF FINAL RUN — ALL DATA HAVE BEEN PROCESSED.
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Fig. 17--Sample output: end-of-data statement

Appendix A

LISTING OF APT COMPUTER PROGRAM VARIABLES

APT COMPUTER PROGRAM VARIABLES*

INPUT LISTING

WEAPON SYSTEM INPUTS

001 WEAPON SYSTEM NUMBER
002 YEAR NUMBER (1., 2., 3., . . . ETC.)
003 ENTERING STUDENTS FROM SIMILAR AIRCRAFT
004 ENTERING STUDENTS FROM DISSIMILAR AIRCRAFT
005 ENTERING STUDENTS FROM DESK JOBS
006 ENTERING STUDENTS FROM UNDERGRADUATE PILOT TRAINING (UPT)
007 LENGTH OF LONG COURSE (WEEKS)
008 LENGTH OF SHORT COURSE (WEEKS)
009 FRACTION OF ENTERING STUDENTS WHO GRADUATE--LONG COURSE
010 FRACTION OF ENTERING STUDENTS WHO GRADUATE--SHORT COURSE
011 HOURS EACH STUDENT REQUIRED TO FLY--TYPE 1 AIRCRAFT, LONG COURSE
012 HOURS EACH STUDENT REQUIRED TO FLY--TYPE 2 AIRCRAFT, LONG COURSE
013 HOURS EACH STUDENT REQUIRED TO FLY--TYPE 3 AIRCRAFT, LONG COURSE
014 HOURS EACH STUDENT REQUIRED TO FLY--TYPE 1, SHORT COURSE
015 HOURS EACH STUDENT REQUIRED TO FLY--TYPE 2, SHORT COURSE
016 HOURS EACH STUDENT REQUIRED TO FLY--TYPE 3, SHORT COURSE
017 SIMULATOR HOURS REQUIRED PER STUDENT--LONG COURSE
018 SIMULATOR HOURS REQUIRED PER STUDENT--SHORT COURSE
019 HOURS STUDENT REQUIRED TO ATTEND GROUND SCHOOL (GS)--LONG COURSE
020 HOURS STUDENT REQUIRED TO ATTEND GROUND SCHOOL (GS)--SHORT COURSE
021 AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 1, LONG COURSE
022 AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 2, LONG COURSE
023 AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 3, LONG COURSE
024 AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 1, SHORT COURSE
025 AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 2, SHORT COURSE
026 AVERAGE NO. STUDENT PILOTS ON STUDENT CREW--TYPE 3, SHORT COURSE
027 HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 1, LONG COURSE
028 HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 2, LONG COURSE
029 HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 3, LONG COURSE
030 HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 1, SHORT COURSE
031 HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 2, SHORT COURSE
032 HOURS INSTRUCTOR FLIES WITH EACH STUDENT--TYPE 3, SHORT COURSE
033 MAXIMUM HOURS PER YEAR INSTRUCTOR FLIES WITH STUDENTS
034 MAXIMUM SIMULATOR HOURS PER YEAR INSTRUCTOR SUPERVISES
035 MAXIMUM TRAINER HOURS PER YEAR INSTRUCTOR SUPERVISES
036 MAXIMUM GS HOURS PER YEAR CCTS INSTRUCTOR TEACHES
037 MAXIMUM GS HOURS PER YEAR FTD INSTRUCTOR TEACHES
038 AVG NO. STUDENT PILOTS ON SIMULATOR AT ONE TIME
039 AVG NO. STUDENT PILOTS IN GS CLASSROOM AT ONE TIME--LONG COURSE
040 AVG NO. STUDENT PILOTS IN GS CLASSROOM AT ONE TIME--SHORT COURSE
041 TRAINER HOURS REQUIRED PER STUDENT--LONG COURSE
042 TRAINER HOURS REQUIRED PER STUDENT--SHORT COURSE
043 FRACTION OF GS HOURS TAUGHT BY CCTS INSTRUCTORS--LONG COURSE
044 FRACTION OF GS HOURS TAUGHT BY CCTS INSTRUCTORS--SHORT COURSE

* ABBREVIATIONS LISTING ON LAST PAGE OF THIS APPENDIX.

045 AIRCRAFT ATTRITION PER 100000 FLYING HOURS--TYPE 1
046 AIRCRAFT ATTRITION PER 100000 FLYING HOURS--TYPE 2 (SEE 144)
047 OTHER FH CHARGED TO CREW TRNG (FRACT. STUD.+SEP. INST. FH)--TYPE 1
048 OTHER FH CHARGED TO CREW TRAINING (FRACTION STUDENT FH)--TYPE 2
049 OTHER FH CHARGED TO CREW TRAINING (FRACTION STUDENT FH)--TYPE 3
050 FRACTION OF TOTAL FH OR COST ALLOCATED TO PILOT TRAINING--TYPE 1
051 FRACTION OF TOTAL FH OR COST ALLOCATED TO PILOT TRAINING--TYPE 2
053 TRAINING HOURS AVAILABLE PER YEAR ON ONE SIMULATOR
054 TRAINING HOURS AVAILABLE PER YEAR ON ONE TRAINER
052 FRACTION OF TOTAL FH OR COST ALLOCATED TO PILOT TRAINING--TYPE 3
055 AVAILABLE FLYING HOURS PER YEAR--TYPE 1
056 AVAILABLE FLYING HOURS PER YEAR--TYPE 2
057 AVAILABLE FLYING HOURS PER YEAR--TYPE 3
058 AIRCRAFT AVAILABLE AT BEGINNING OF FIRST YEAR--TYPE 1
059 AIRCRAFT AVAILABLE AT BEGINNING OF FIRST YEAR--TYPE 2
061 SIMULATORS AVAILABLE AT BEGINNING OF FIRST YEAR
060 AIRCRAFT AVAILABLE AT BEGINNING OF FIRST YEAR--TYPE 3
062 TRAINERS AVAILABLE AT BEGINNING OF FIRST YEAR
063 FIXED NUMBER OF INSTRUCTOR-SUPERV+ADMIN--SQDN LEVEL
064 VARIABLE NUMBER OF INSTRUCTOR-SUPERV+ADMIN (PER INST.)--SQDN LEVEL
065 FIXED NUMBER OF ACADEMIC-PROGRAM SUPERVISORS--SQUADRON LEVEL
066 VARIABLE NO. ACAD-PROG SUPERV, PER STUD. IN STUD. LOAD--SQDN LEVEL
067 TOTAL STANDARD-EVALUATION PERSONNEL REQUIRED
068 AIRCRAFT MAINTENANCE PERSONNEL REQUIRED PER FLYING HOUR--TYPE 1
069 AIRCRAFT MAINTENANCE PERSONNEL REQUIRED PER FLYING HOUR--TYPE 2
070 AIRCRAFT MAINTENANCE PERSONNEL REQUIRED PER FLYING HOUR--TYPE 3
071 SIMULATOR OPER+MTC PERS AUTHORIZED PER SIMULATOR OR PER SIM HOUR
072 TRAINER OPER+MTC PERS AUTHORIZED PER TRAINER
073 FIXED NUMBER OF ADMINISTRATIVE PERSONNEL--WING LEVEL
074 VARIABLE NO. ADMIN PERS--WING LEVEL (PER OPER+MTC PERSONNEL)
075 FIXED NUMBER OF SUPPORT PERSONNEL
076 VARIABLE NO. SUPPORT PERS (PER TOTAL STUDENT LOAD+OPER+MTC+ADMIN)
077 FRACTION OF GS CCTS INSTRUCTORS WHO ARE OFFICERS
078 FRACTION OF GS CCTS INSTRUCTORS WHO ARE AIRMEN
079 FRACTION OF GS FTD INSTRUCTORS WHO ARE OFFICERS
080 FRACTION OF GS FTD INSTRUCTORS WHO ARE AIRMEN
081 FRACTION OF INSTRUCTOR-SUPERV+ADMIN (SQDN LEVEL) WHO ARE OFFICERS
082 FRACTION OF INSTRUCTOR-SUPERV+ADMIN (SQDN LEVEL) WHO ARE AIRMEN
083 FRACTION OF ACAD-PROGRM SUPERV+ADMIN (SQDN LEVEL) WHO ARE OFFICERS
084 FRACTION OF ACAD-PROGRM SUPERV+ADMIN (SQDN LEVEL) WHO ARE AIRMEN
085 FRACTION OF AIRCRAFT MTC PERSONNEL WHO ARE OFFICERS
086 FRACTION OF AIRCRAFT MTC PERSONNEL WHO ARE AIRMEN
087 FRACTION OF SIMULATOR AND TRAINER MTC+OPER PERS WHO ARE OFFICERS
088 FRACTION OF SIMULATOR AND TRAINER MTC+OPER PERS WHO ARE AIRMEN .
089 FRACTION OF ADMIN PERSONNEL (WING LEVEL) WHO ARE OFFICERS
090 FRACTION OF ADMIN PERSONNEL (WING LEVEL) WHO ARE AIRMEN
091 FRACTION OF SUPPORT PERSONNEL WHO ARE OFFICERS
092 FRACTION OF SUPPORT PERSONNEL WHO ARE AIRMEN
093 FRACTION OF OFFICERS WHO ARE RATED
094 MIN INCREASE IN STUDENT LOAD BEFORE I.I. TRNG EQUIP+SPARES JUSTIF.
095* I.I. COST PER AIRCRAFT--TYPE 1
096 I.I. COST PER AIRCRAFT--TYPE 2

ALL COSTS (INPUT AND OUTPUT) ARE IN THOUSANDS OF DOLLARS EXCEPT THOSE DENOTED BY ($).

097 I.I. COST PER AIRCRAFT--TYPE 3
098 I.I. COST PER SIMULATOR
099 I.I. COST PER TRAINER
100 FRACTION OF I.I. SIMULATOR COST FOR SIMULATOR SPARES COST
101 I.I. COST FOR TRNG EQUIP+SPARES PER INCREASE IN STUDENT LOAD ($)
102 OPERATING COST PER FLYING HOUR FOR DEPOT MTC--TYPE 1 ($)
103 OPERATING COST PER FLYING HOUR FOR DEPOT MTC--TYPE 2 ($)
104 OPERATING COST PER FLYING HOUR FOR DEPOT MTC--TYPE 3 ($)
105 OPERATING COST PER FLYING HOUR FOR POL--TYPE 1 ($)
106 OPERATING COST PER FLYING HOUR FOR POL--TYPE 2 ($)
107 OPERATING COST PER FLYING HOUR FOR POL--TYPE 3 ($)
108 OPERATING COST PER FLYING HOUR FOR MATERIAL--TYPE 1 ($)
109 OPERATING COST PER FLYING HOUR FOR MATERIAL--TYPE 2 ($)
110 OPERATING COST PER FLYING HOUR FOR MATERIAL--TYPE 3 ($)
111 OPERATING COST PER STUDENT FOR MUNITIONS--LONG COURSE ($)
112 OPERATING COST PER STUDENT FOR MUNITIONS--SHORT COURSE ($)
113 OPERATING COST PER STUDENT FOR AVERAGE TDY/PCS ($)
114 OPERATING COST PER SIM PER YR FOR SIM MTC--MATERIAL, SERVICES
115 OPERATING COST PER YEAR FOR TARGET RENTAL
116 R AND D COST
117 DUMP PRINTOUT DESIGNATOR (0./1.--DO NOT/DO PRINT DUMP)
118 ZERO-OUTPUT DESIGNATOR (0./1.--DO NOT/DO ZERO OUTPUT EXCEPT GRADS)
119 CLEAR DESIGNATOR (0./1.--DO NOT/DO ZERO OUT ALL F VARIABLES
120 WEAPON SYSTEM VARIABLE-LISTING PRINT DESIGNATOR

CONSTANT INPUTS

121 BEGINNING YEAR (E.G., 1969)
122 MIN INCREASE IN PERM PARTY BEFORE I.I. EQUIP+SUPPLIES JUSTIFIED
123 I.I. COST FOR BASE SUPPORT EQUIP+SPARES PER PERM PARTY INCREASE($)
124 I.I. COST FOR BASE SUPPLY INVENTORY PER PERM PARTY INCREASE ($)
125 I.I. COST FOR PERM-PARTY-INCREASE TRAINING OFF BASE ($)
126 I.I. COST FOR PERM-PARTY-INCREASE TRAVEL ($)
127 OPER. COST PER YEAR FOR AVG PAY OF STUDENT ($)
128 OPER. COST PER YEAR FOR AVG PAY OF PERM PARTY RATED OFFICER ($)
129 OPER. COST PER YEAR FOR AVG PAY OF PERM PARTY NONRATED OFFICER ($)
130 OPER. COST PER YEAR FOR AVG PAY OF PERM PARTY AIRMAN ($)
131 OPER. COST PER YEAR FOR AVG PAY OF CIVILIAN ($)
132 OPER. COST PER YEAR FOR AVG TDY OF PERM PARTY ($)
133 OPER. COST PER YEAR FOR SERVICES--AVG PER PERSON ON BASE ($)
134 OPER. COST PER YEAR FOR SUPPLIES+EQUIP PER PERSON ON BASE ($)
135* FRACTION OF SIMULATOR HOURS OR COSTS ALLOCATED TO PILOT TRAINING
136 OPER. COST PER YEAR FOR SUPPORT ACFT--AVG PER PERSON ON BASE ($)
137 OPER. COST PER YEAR FOR PERM PARTY OFFICER TRAINING OFF BASE ($)
138 OPER. COST PER YEAR FOR PERM PARTY AIRMAN TRAINING OFF BASE ($)
139 OPER. COST PER YEAR FOR AVERAGE PCS PER PERM PARTY PERSON ($)
140 FRACTION OF I.I. AIRCRAFT COST FOR AIRCRAFT SPARES COST
141 VARIABLE-LISTING READ DESIGNATOR (0./1.--DO NOT/DO READ VARIABLES)
142* INSTRUCTOR LEAD/TOW FLYING HOURS PER STUDENT--TYPE 1, LONG COURSE
143* INSTRUCTOR LEAD/TOW FLYING HOURS PER STUDENT--TYPE 1, SHORT COURSE
144* AIRCRAFT ATTRITION PER 100000 FLYING HOURS--TYPE 3 (SEE 045, 046)
145* OPER. COST PER YEAR FOR TRAINER MTC PER TRNR--MATERIAL, SERVICES

PON SYSTEM INPUT. SEE ALSO ADDRESSES 217, 218, AND 219.

OUTPUT LISTING

INTERNAL COUNTERS

146 PAGE NUMBER
147 YEAR COUNTER
148 END-OF-DATA DESIGNATOR
149 PASS COUNTER

CURRENT YEAR PLUS STUDENT AND GRADUATE TOTALS

150 CURRENT YEAR
151 TOTAL ENTERING STUDENTS
152 TOTAL ENTERING STUDENTS--LONG COURSE
153 TOTAL ENTERING STUDENTS--SHORT COURSE
154 TOTAL GRADUATES--LONG COURSE
155 TOTAL GRADUATES--SHORT COURSE
156 TOTAL GRADUATES
157 AVERAGE NUMBER OF STUDENTS PER YEAR--LONG COURSE
158 AVERAGE NUMBER OF STUDENTS PER YEAR--SHORT COURSE
159 AVERAGE STUDENT LOAD FOR LONG COURSE
160 AVERAGE STUDENT LOAD FOR SHORT COURSE
161 TOTAL AVERAGE STUDENT LOAD

TRAINING HOURS

162 TOTAL STUDENT FLYING HOURS--TYPE 1, LONG COURSE
163 TOTAL STUDENT FLYING HOURS--TYPE 2, LONG COURSE
164 TOTAL STUDENT FLYING HOURS--TYPE 3, LONG COURSE
165 TOTAL STUDENT FLYING HOURS--TYPE 1, SHORT COURSE
166 TOTAL STUDENT FLYING HOURS--TYPE 2, SHORT COURSE
167 TOTAL STUDENT FLYING HOURS--TYPE 3, SHORT COURSE
168 TOTAL STUDENT FLYING HOURS--TYPE 1
169 TOTAL STUDENT FLYING HOURS--TYPE 2
170 TOTAL STUDENT FLYING HOURS--TYPE 3
171 INSTRUCTOR FH PER STUDENT--ALL AIRCRAFT TYPES, LONG COURSE
172 INSTRUCTOR FH PER STUDENT--ALL AIRCRAFT TYPES, SHORT COURSE
173 TOTAL HOURS INSTRUCTOR FLIES WITH STUDENTS--LONG COURSE
174 TOTAL HOURS INSTRUCTOR FLIES WITH STUDENTS--SHORT COURSE
175 TOTAL HOURS INSTRUCTOR FLIES WITH STUDENTS
176 TOTAL STUDENT SIMULATOR HOURS--LONG COURSE
177 TOTAL STUDENT SIMULATOR HOURS--SHORT COURSE
178 TOTAL STUDENT SIMULATOR HOURS
179 TOTAL STUDENT TRAINER HOURS--LONG COURSE
180 TOTAL STUDENT TRAINER HOURS--SHORT COURSE
181 TOTAL STUDENT TRAINER HOURS
182 TOTAL GROUND-SCHOOL CLASSROOM HOURS--LONG COURSE
183 TOTAL GROUND-SCHOOL CLASSROOM HOURS--SHORT COURSE
184 TOTAL GROUND-SCHOOL CLASSROOM HOURS
185 TOTAL GS CLASSROOM HOURS TAUGHT BY CCTS INSTRUCTORS--LONG COURSE
186 TOTAL GS CLASSROOM HOURS TAUGHT BY CCTS INSTRUCTORS--SHORT COURSE
187 TOTAL GS CLASSROOM HOURS TAUGHT BY CCTS INSTRUCTORS
188 TOTAL GS CLASSROOM HOURS TAUGHT BY FTD INSTRUCTORS--LONG COURSE

189 TOTAL GS CLASSROOM HOURS TAUGHT BY FTD INSTRUCTORS--SHORT COURSE
190 TOTAL GS CLASSROOM HOURS TAUGHT BY FTD INSTRUCTORS
191 OTHER FLYING HOURS--TYPE 1
192 OTHER FLYING HOURS--TYPE 2
193 OTHER FLYING HOURS--TYPE 3
194 TOTAL FLYING HOURS--TYPE 1
195 TOTAL FLYING HOURS--TYPE 2
196 TOTAL FLYING HOURS--TYPE 3
197 FLYING HOURS CHARGED TO PILOT TRAINING--TYPE 1
198 FLYING HOURS CHARGED TO PILOT TRAINING--TYPE 2
199 FLYING HOURS CHARGED TO PILOT TRAINING--TYPE 3

EQUIPMENT REQUIREMENTS

200 CURRENT INVENTORY--TYPE 1
201 CURRENT INVENTORY--TYPE 2
202 CURRENT INVENTORY--TYPE 3
203 CURRENT INVENTORY--SIMULATORS
204 CURRENT INVENTORY--TRAINERS
205 AIRCRAFT REQUIRED--TYPE 1
206 AIRCRAFT REQUIRED--TYPE 2
207 AIRCRAFT REQUIRED--TYPE 3
208 SIMULATORS REQUIRED
209 TRAINERS REQUIRED
210 AIRCRAFT TO BE PROCURED--TYPE 1
211 AIRCRAFT TO BE PROCURED--TYPE 2
212 AIRCRAFT TO BE PROCURED--TYPE 3
213 SIMULATORS TO BE PROCURED
214 TRAINERS TO BE PROCURED
215 TOTAL INSTRUCTOR LEAD/TOW FLYING HOURS--TYPE 1, LONG COURSE
216 TOTAL INSTRUCTOR LEAD/TOW FLYING HOURS--TYPE 1, SHORT COURSE
217 RECURRING INVESTMENT COST FACTOR--TYPE 1 (WEAPON SYSTEM INPUT)
218 RECURRING INVESTMENT COST FACTOR--TYPE 2 (WEAPON SYSTEM INPUT)
219 RECURRING INVESTMENT COST FACTOR--TYPE 3 (WEAPON SYSTEM INPUT)
220 SIMULATOR HOURS CHARGED TO PILOT TRAINING

PERSONNEL REQUIREMENTS

221 TOTAL FLYING INSTRUCTORS REQUIRED
222 TOTAL SIMULATOR INSTRUCTORS REQUIRED
223 TOTAL TRAINER INSTRUCTORS REQUIRED
224 TOTAL GROUND-SCHOOL CCTS INSTRUCTORS REQUIRED
225 TOTAL GROUND-SCHOOL FTD INSTRUCTORS REQUIRED
226 TOTAL INSTRUCTORS REQUIRED
227 TOTAL INSTRUCTOR SUPERVISORS AND ADMIN PERS REQUIRED--SQDN LEVEL
228 TOTAL ACAD-PROGRAM SUPERVISORS AND ADMIN PERS REQUIRED--SQDN LEVEL
229 TOTAL STANDARD-EVALUATION PERSONNEL REQUIRED
230 TOTAL NONSTUDENT OPERATIONS PERSONNEL
231 TOTAL AIRCRAFT MAINTENANCE PERSONNEL--TYPE 1
232 TOTAL AIRCRAFT MAINTENANCE PERSONNEL--TYPE 2
233 TOTAL AIRCRAFT MAINTENANCE PERSONNEL--TYPE 3
234 TOTAL AIRCRAFT MAINTENANCE PERSONNEL
TOTAL SIMULATOR MAINTENANCE AND OPERATING PERSONNEL
TOTAL TRAINER MAINTENANCE AND OPERATING PERSONNEL

237 TOTAL SIMULATOR AND TRAINER MAINTENANCE AND OPERATING PERSONNEL
238 TOTAL OPERATIONS AND MAINTENANCE PERSONNEL
239 TOTAL ADMINISTRATIVE PERSONNEL (WING LEVEL)
240 TOTAL STUDENT LOAD + OPERATIONS + MTC + ADMINISTRATIVE PERSONNEL
241 TOTAL SUPPORT PERSONNEL
242 TOTAL PERSONNEL CHARGED TO PILOT TRAINING, INCLUDING STUDENTS
243 TOTAL PERMANENT PARTY PERSONNEL
244 TOTAL PERMANENT PARTY OFFICERS
245 TOTAL PERMANENT PARTY AIRMEN
246 TOTAL PERMANENT PARTY MILITARY PERSONNEL
247 TOTAL CIVILIANS
248 TOTAL PERMANENT PARTY RATED OFFICERS
249 TOTAL PERMANENT PARTY NONRATED OFFICERS
250 CHANGE IN STUDENT LOAD
251 CHANGE IN TOTAL PERSONNEL, INCLUDING STUDENTS
252 CHANGE IN TOTAL PERMANENT PARTY PERSONNEL
253 CHANGE IN TOTAL PERMANENT PARTY MILITARY PERSONNEL
254 CHANGE IN PERM. PARTY LESS CHANGE DUE TO ALLOC. FRACTION VARIATION
255 ADJUSTMENT TO ELIM. EFFECT ON I.I. COST OF CHANGE IN ALLOC. FRACT.
256 CUMULATIVE CHANGE IN STUDENT LOAD UNTIL THRESHOLD IS REACHED
257 CUMULATIVE CHANGE IN ADJ. PERM PARTY UNTIL THRESHOLD IS REACHED

INITIAL INVESTMENT COSTS (THOUSANDS OF DOLLARS)

258 I.I. COST OF AIRCRAFT TO BE PROCURED--TYPE 1
259 I.I. COST OF AIRCRAFT TO BE PROCURED--TYPE 2
260 I.I. COST OF AIRCRAFT TO BE PROCURED--TYPE 3
261 I.I. COST OF SIMULATORS TO BE PROCURED
262 I.I. COST OF TRAINERS TO BE PROCURED
263 I.I. COST OF AIRCRAFT SPARES--TYPE 1
264 I.I. COST OF AIRCRAFT SPARES--TYPE 2
265 I.I. COST OF AIRCRAFT SPARES--TYPE 3
266 I.I. COST OF SIMULATOR SPARES
267 I.I. COST OF TRAINING EQUIP AND SPARES FOR STUDENT LOAD INCREASE
268 I.I. COST OF BASE SUPPORT EQUIP+SPARES FOR PERM PARTY INCREASE
269 I.I. COST OF SUPPLIES FOR PERMANENT PARTY INCREASE
270 I.I. COST OF TRAINING FOR PERMANENT PARTY INCREASE
271 I.I. COST OF TRAVEL FOR PERMANENT PARTY INCREASE (PCS)
272 TOTAL INCREASE IN I.I. COST

OPERATING COSTS AND TOTAL SYSTEM COST (THOUSANDS OF DOLLARS)

273 OPERATING COST OF DEPOT MAINTENANCE
274 OPERATING COST OF POL
275 OPERATING COST OF MATERIAL
276 OPERATING COST OF TOTAL FLYING HOURS
277 OPERATING COST OF MUNITIONS--LONG COURSE
278 OPERATING COST OF MUNITIONS--SHORT COURSE
279 OPERATING COST OF STUDENT PAY
280 OPERATING COST OF RATED OFFICER PAY
281 OPERATING COST OF NONRATED OFFICER PAY
282 OPERATING COST OF AIRMEN PAY
283 OPERATING COST OF TOTAL PERMANENT PARTY MILITARY PAY
284 OPERATING COST OF TOTAL MILITARY PAY, INCLUDING STUDENTS

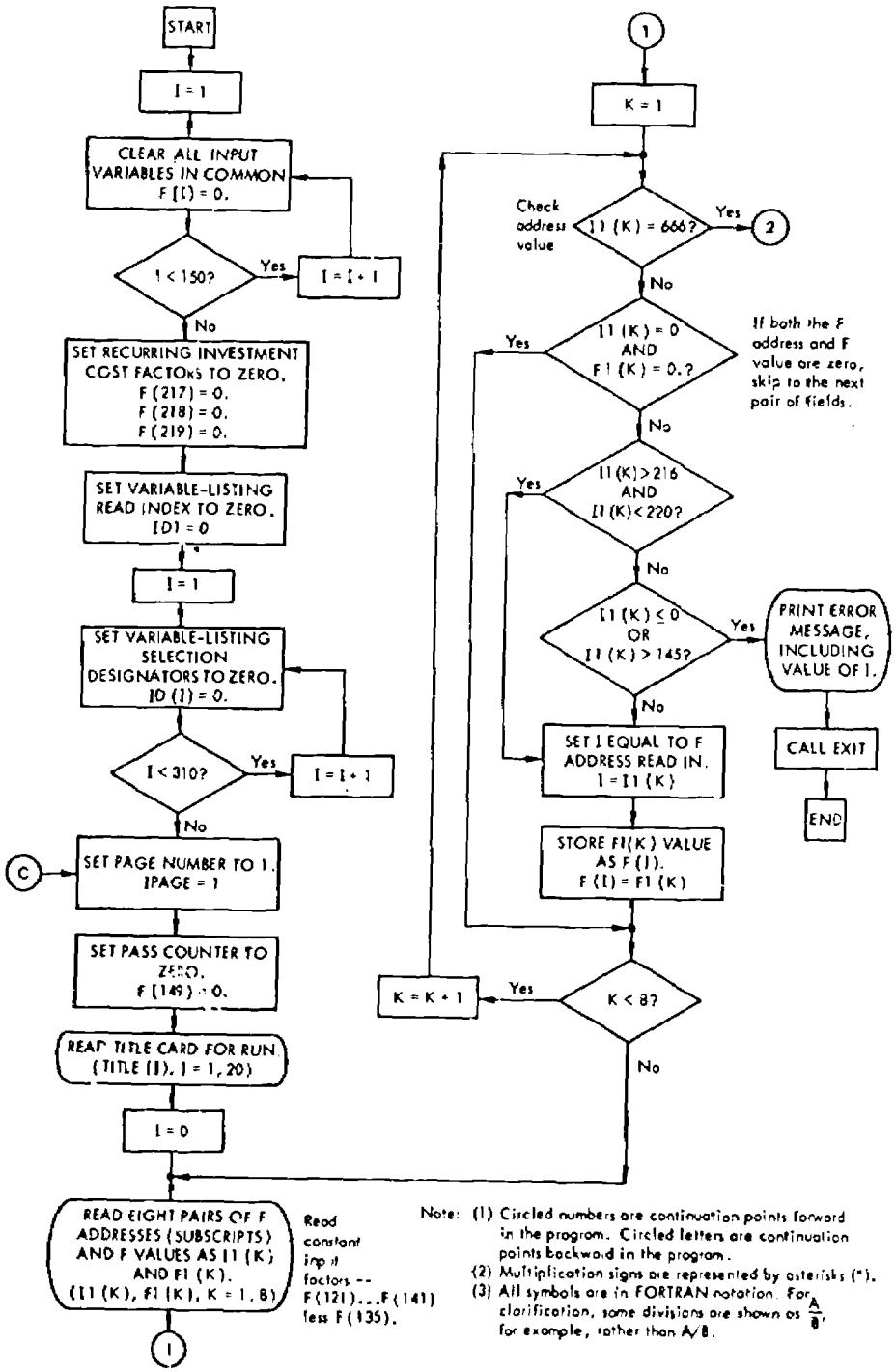
285 OPERATING COST OF CIVILIAN PAY
286 OPERATING COST OF TOTAL PAY--MILITARY PLUS CIVILIANS
287 OPERATING COST OF STUDENT TDY/PCS
288 OPERATING COST OF ALL PERMANENT PARTY PERSONNEL TDY
289 OPERATING COST OF SERVICES
290 OPERATING COST OF SUPPLIES AND EQUIPMENT
291 OPERATING COST OF SIMULATOR MTC, MATERIAL, AND SERVICES
292 OPERATING COST OF TRAINER MTC, MATERIAL, AND SERVICES
293 OPERATING COST OF TARGET RENTAL
294 OPERATING COST OF SUPPORT AIRCRAFT
295 OPERATING COST OF OFFICERS TRAINING
296 OPERATING COST OF AIRMEN TRAINING
297 OPERATING COST OF PERMANENT CHANGE OF STATION
298 TOTAL OTHER OPERATING COST, INCLUDING RECURRING INVESTMENT
299 TOTAL OPERATING COST, INCLUDING RECURRING INVESTMENT
300 OPERATING COST PER GRADUATE ($)
301 TOTAL SYSTEM COST (INVESTMENT + OPERATING), EXCLUDING R AND D
302 AIRCRAFT LOST TO ATTRITION--TYPE 1
303 AIRCRAFT LOST TO ATTRITION--TYPE 2
304 AIRCRAFT LOST TO ATTRITION--TYPE 3
305 RECURRING INVESTMENT COST (OPERATING COST)--TYPE 1
306 RECURRING INVESTMENT COST (OPERATING COST)--TYPE 2
307 RECURRING INVESTMENT COST (OPERATING COST)--TYPE 3
308 TOTAL AIRCRAFT RECURRING INVESTMENT COST (OPERATING COST)
309 NOT USED
310 NOT USED

ABBREVIATIONS LISTING

ACAD	ACADEMIC
ACFT	AIRCRAFT
ADMIN	ADMINISTRATIVE
ADJ.	ADJUSTED
ALLOC.	ALLOCATION
AVG	AVERAGE
CCTS	COMBAT CREW TRAINING SCHOOL(S)
ELIM.	ELIMINATE
EQUIP	EQUIPMENT
FH	FLYING HOUR(S)
FRACT.	FRACTION
FTD	FIELD TRAINING DETACHMENT
GS	GROUND SCHCOL
INST.	INSTRUCTOR(S)
I.I.	INITIAL INVESTMENT
JUSTIF.	JUSTIFIED
MIN	MINIMUM
MTC	MAINTENANCE
NO.	NUMBER
OPER.	OPERATING
PCS	PERMANENT CHANGE OF STATION
PERM	PERMANENT
PERS	PERSONNEL
POL	PETROLEUM-OIL-LUBRICANTS
PROG	PROGRAM
R AND D	RESEARCH AND DEVELOPMENT
SEP.	SEPARATE
SIM	SIMULATOR(S)
SQDN	SQUADRON
STUD.	STUDENT(S)
SUPERV	SUPERVISOR(S)
TDY	TEMPORARY DUTY
TRNG	TRAINING
TRNR	TRAINER(S)
UPT	UNDERGRADUATE PILOT TRAINING

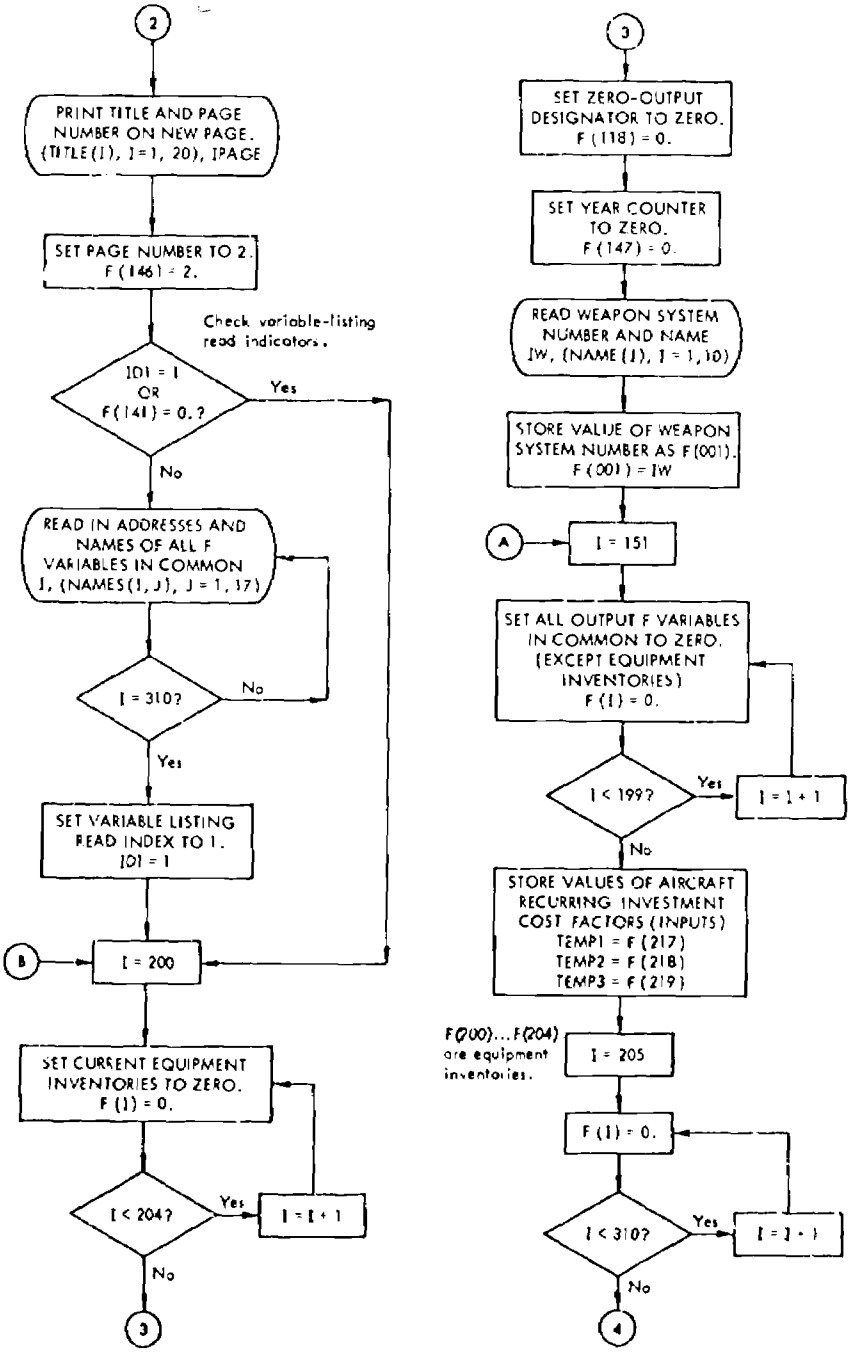
Appendix B

FLOW CHARTS OF APT COMPUTER PROGRAM

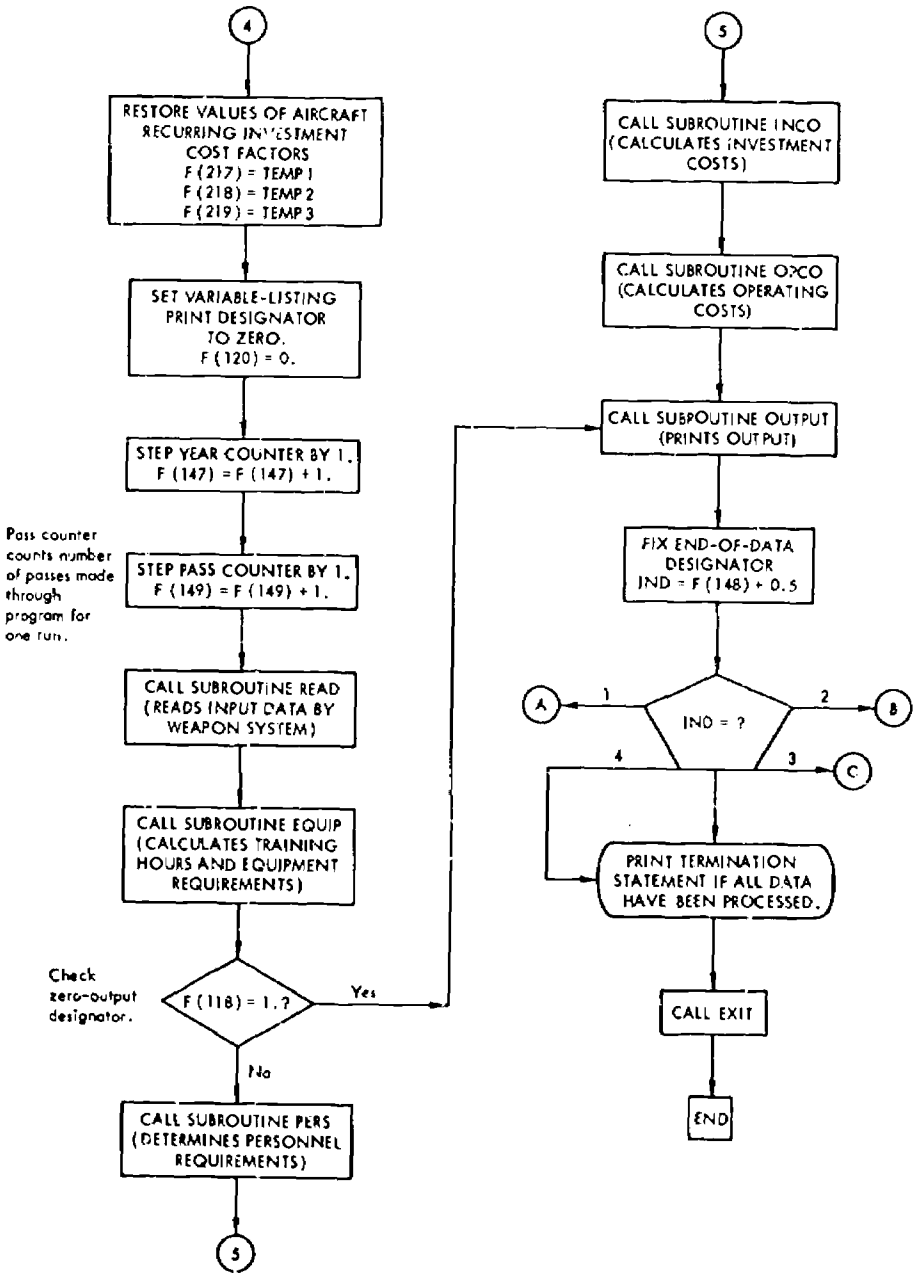


Note: (1) Circled numbers are continuation points forward in the program. Circled letters are continuation points backward in the program.
(2) Multiplication signs are represented by asterisks (*).
(3) All symbols are in FORTRAN notation. For clarification, some divisions are shown as $\frac{A}{B}$, for example, rather than A/B.

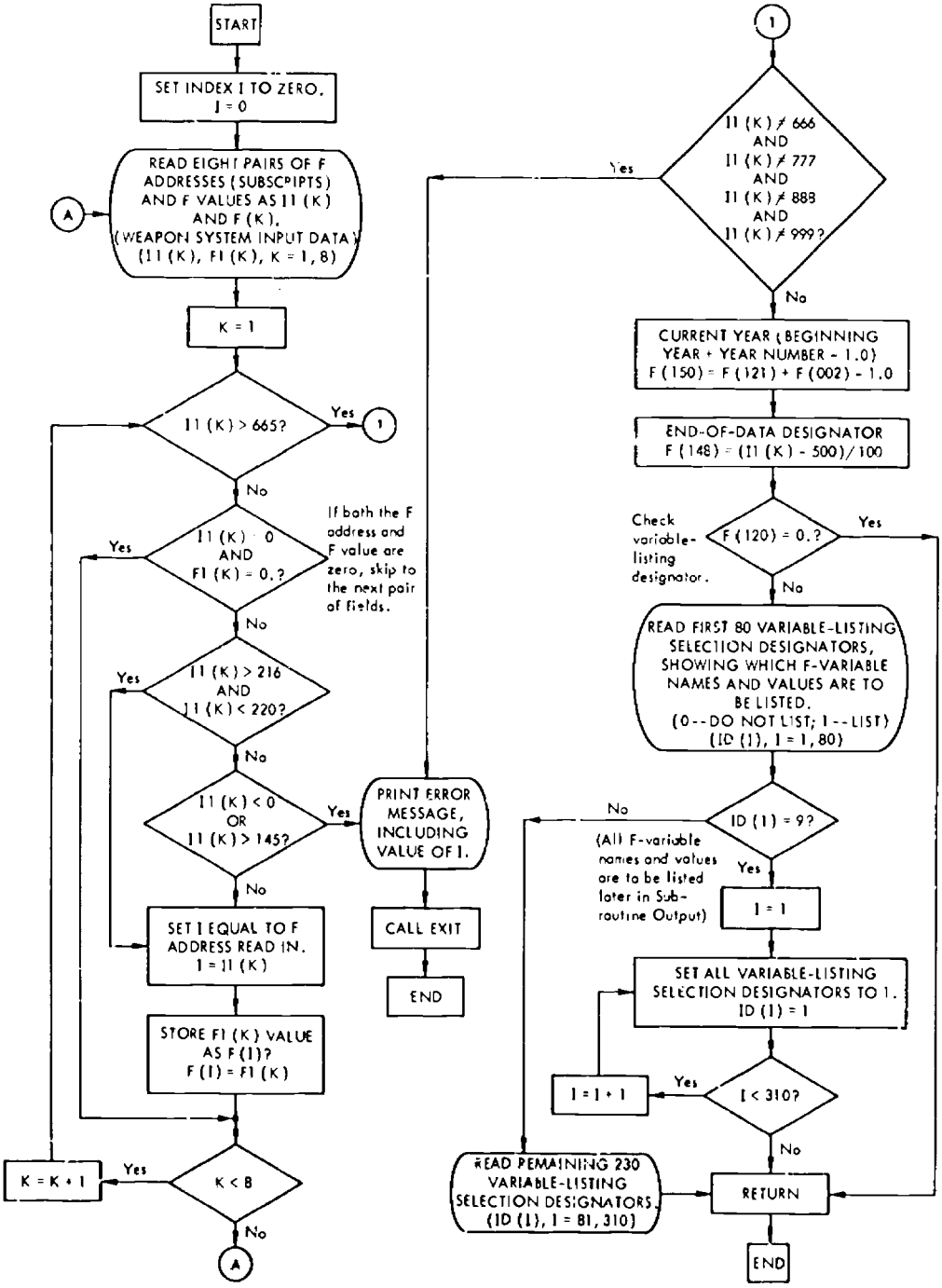
MAIN ROUTINE



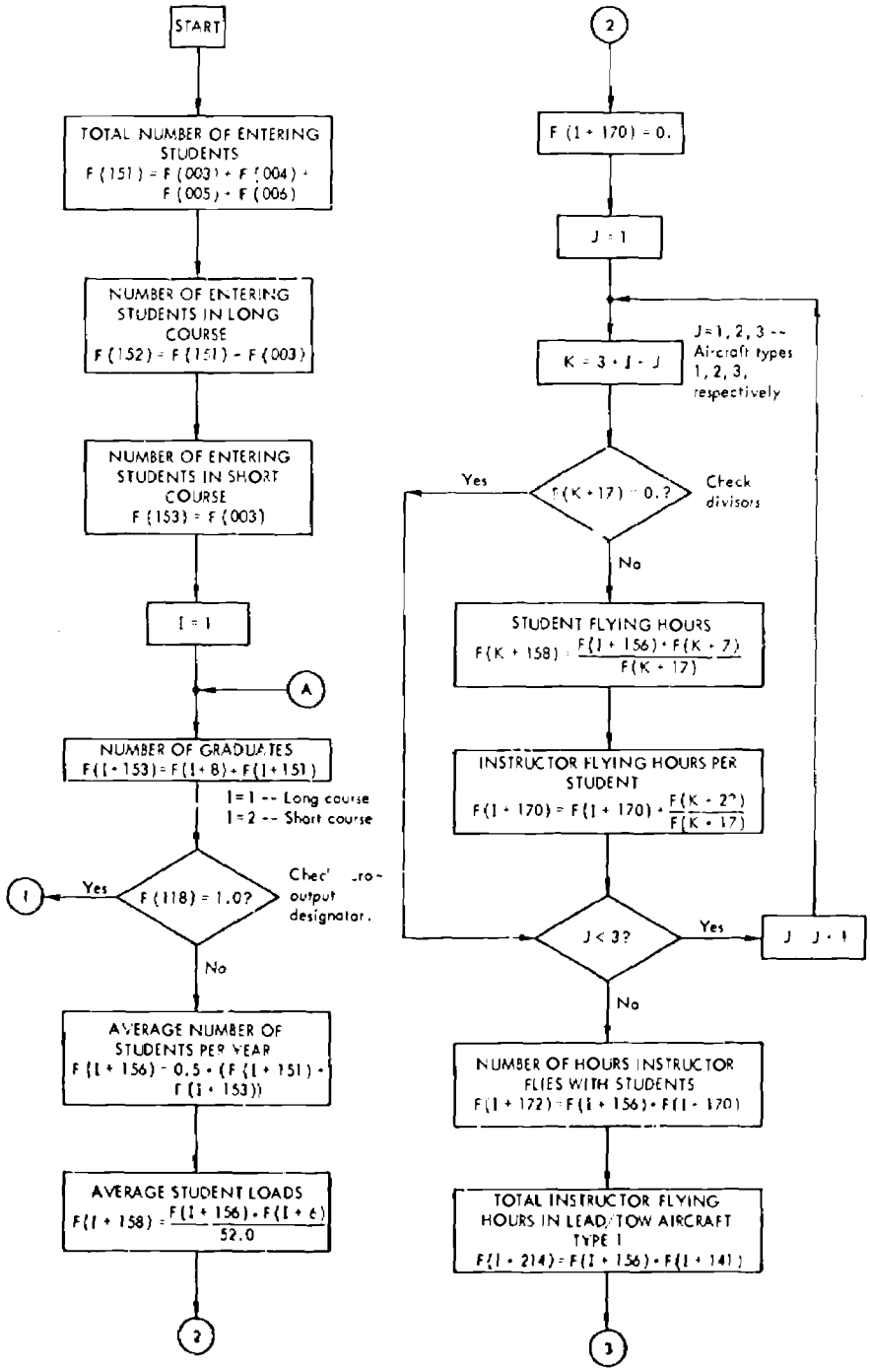
MAIN ROUTINE (CONTINUED)



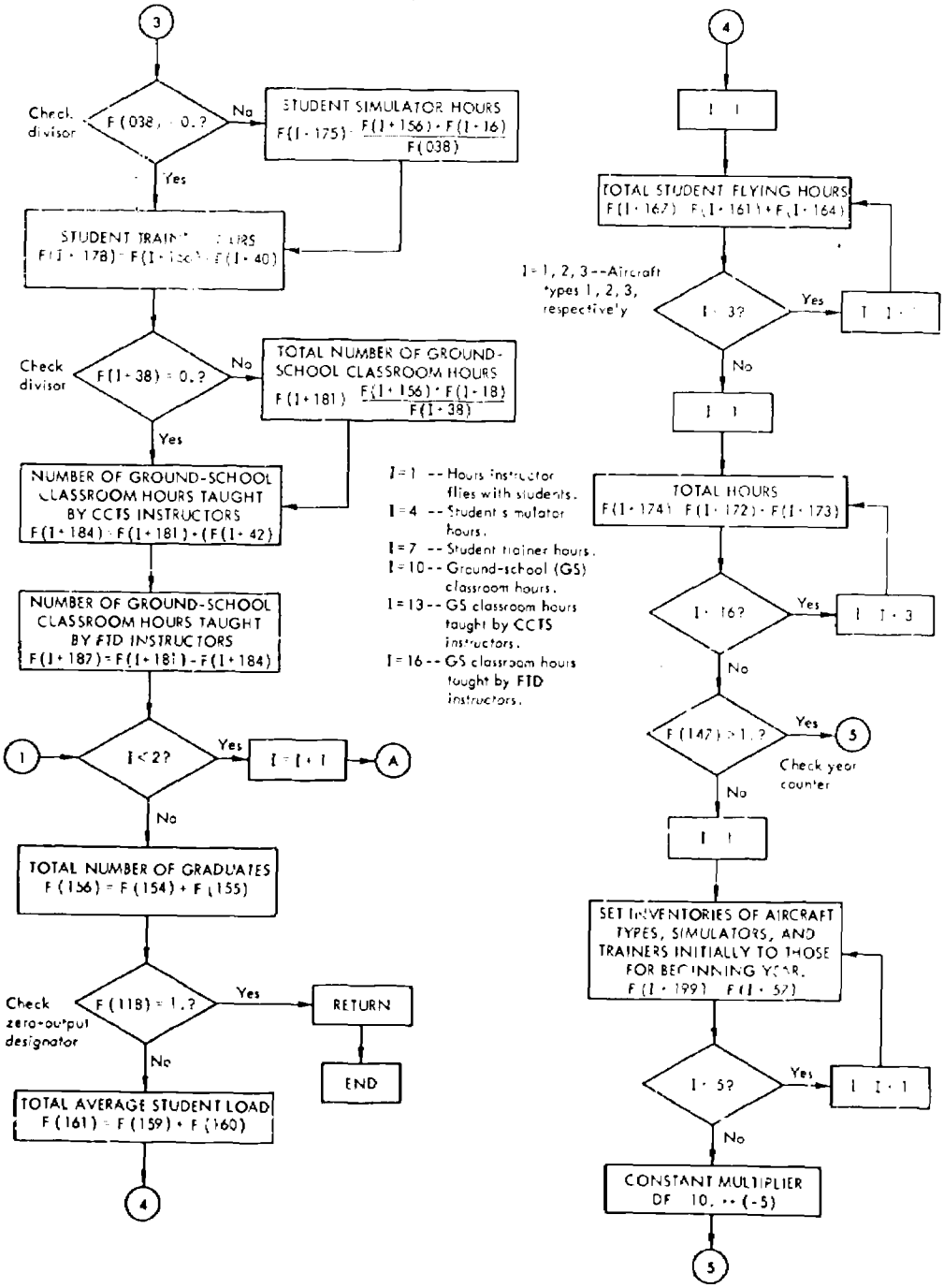
MAIN ROUTINE (CONTINUED)



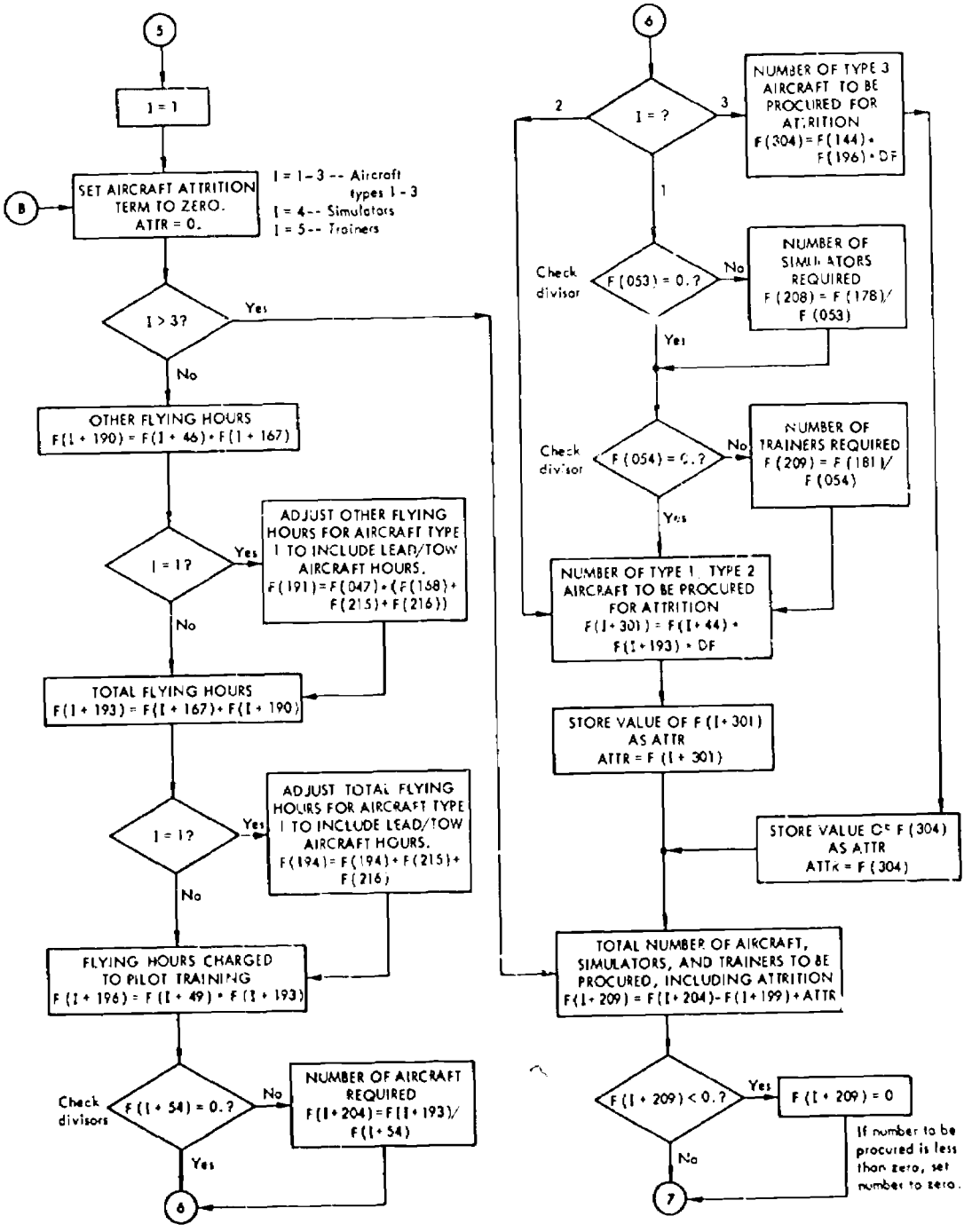
SUBROUTINE READ



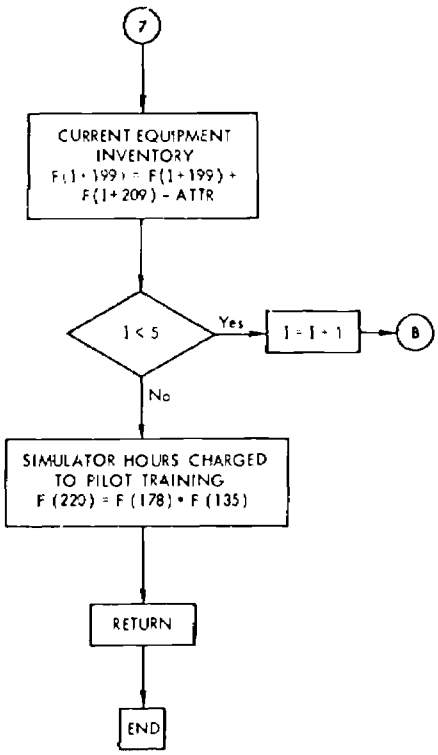
SUBROUTINE EQUIP



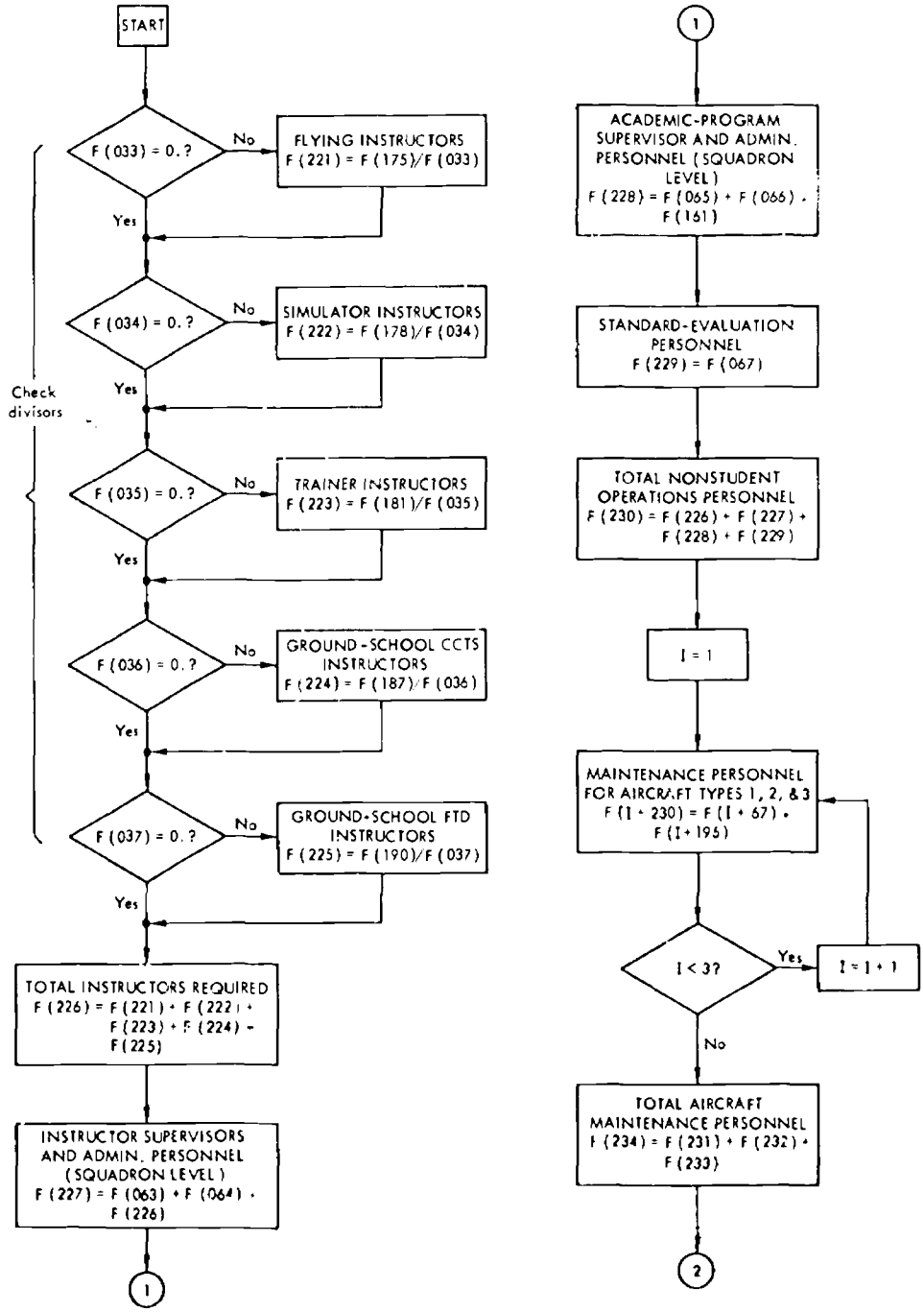
SUBROUTINE EQUIP (CONTINUED)



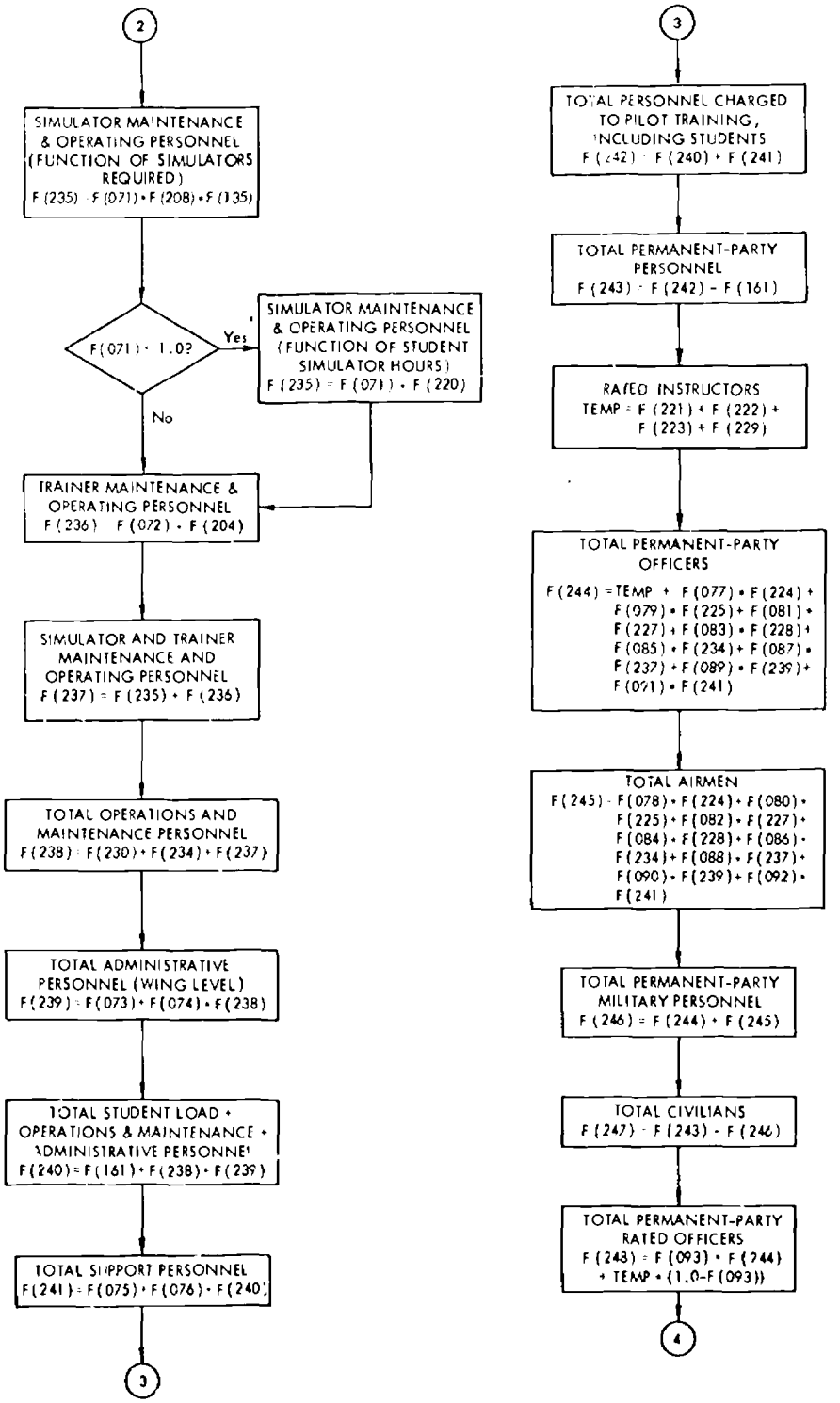
SUBROUTINE EQUIP (CONTINUED)

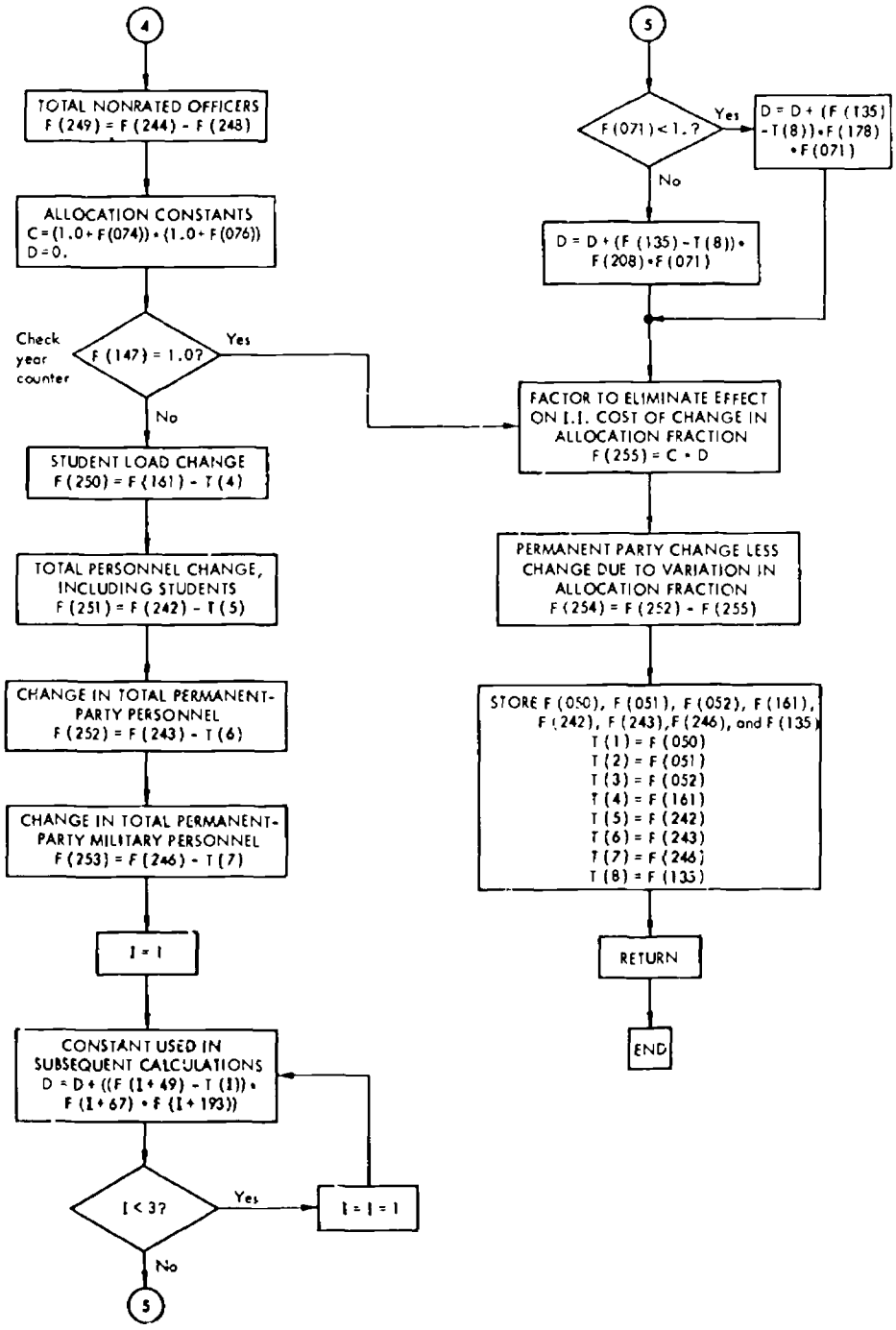


SUBROUTINE EQUIP (CONTINUED)

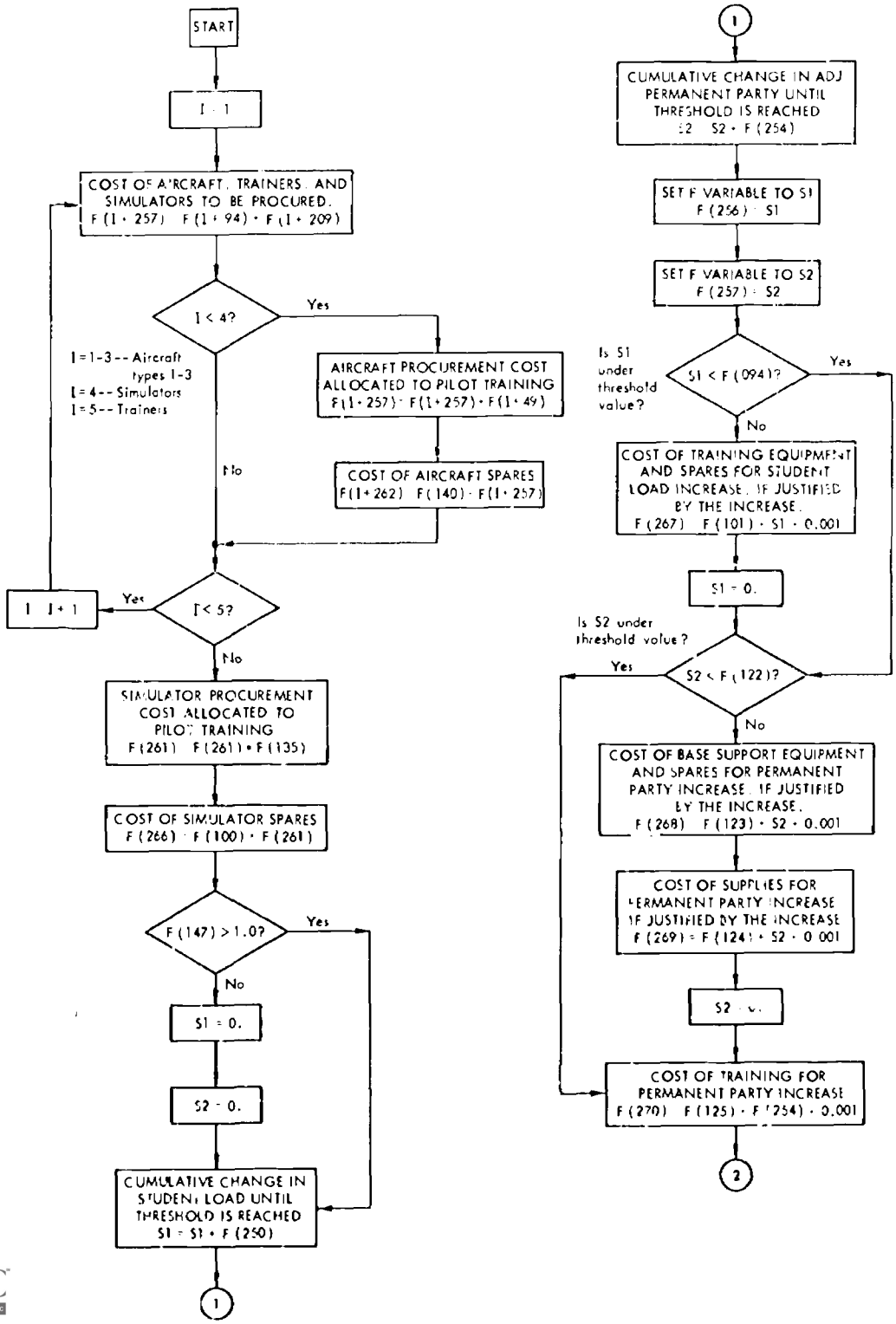


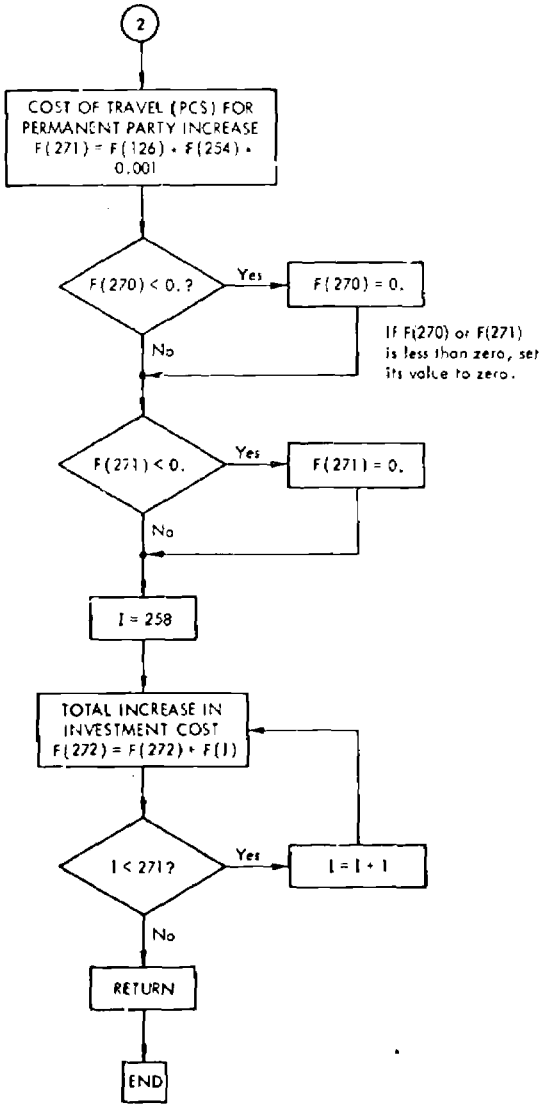
SUBROUTINE PERS


2
SIMULATOR MAINTENANCE & OPERATING PERSONNEL (FUNCTION OF SIMULATORS REQUIRED)
F(235) = F(071) * F(208) * F(135)
F(071) = 1.0?
Yes
SIMULATOR MAINTENANCE & OPERATING PERSONNEL (FUNCTION OF STUDENT SIMULATOR HOURS)
F(235) = F(071) * F(220)
No
TRAINER MAINTENANCE & OPERATING PERSONNEL
F(236) = F(072) * F(204)
SIMULATOR AND TRAINER MAINTENANCE AND OPERATING PERSONNEL
F(237) = F(235) + F(236)
TOTAL OPERATIONS AND MAINTENANCE PERSONNEL
F(238) = F(230) + F(234) + F(237)
TOTAL ADMINISTRATIVE PERSONNEL (WING LEVEL)
F(239) = F(073) + F(074) + F(238)
TOTAL STUDENT LOAD + OPERATIONS & MAINTENANCE + ADMINISTRATIVE PERSONNEL
F(240) = F(161) + F(238) + F(239)
TOTAL SUPPORT PERSONNEL
F(241) = F(075) + F(076) + F(240)
3
3
TOTAL PERSONNEL CHARGED TO PILOT TRAINING, INCLUDING STUDENTS
F(242) = F(240) + F(241)
TOTAL PERMANENT-PARTY PERSONNEL
F(243) = F(242) - F(161)
RATED INSTRUCTORS
TEMP = F(221) + F(222) + F(223) + F(229)
TOTAL PERMANENT-PARTY OFFICERS
F(244) = TEMP + F(077) * F(224) + F(079) * F(225) + F(081) * F(227) + F(083) * F(228) + F(085) * F(234) + F(087) * F(237) + F(089) * F(239) + F(091) * F(241)
TOTAL AIRMEN
F(245) = F(078) * F(224) * F(080) * F(225) * F(082) * F(227) * F(084) * F(228) * F(086) * F(234) + F(088) * F(237) * F(090) * F(239) + F(092) * F(241)
TOTAL PERMANENT-PARTY MILITARY PERSONNEL
F(246) = F(244) + F(245)
TOTAL CIVILIANS
F(247) = F(243) - F(246)
TOTAL PERMANENT-PARTY RATED OFFICERS
F(248) = F(093) * F(244) + TEMP * (1.0-F(093))
4

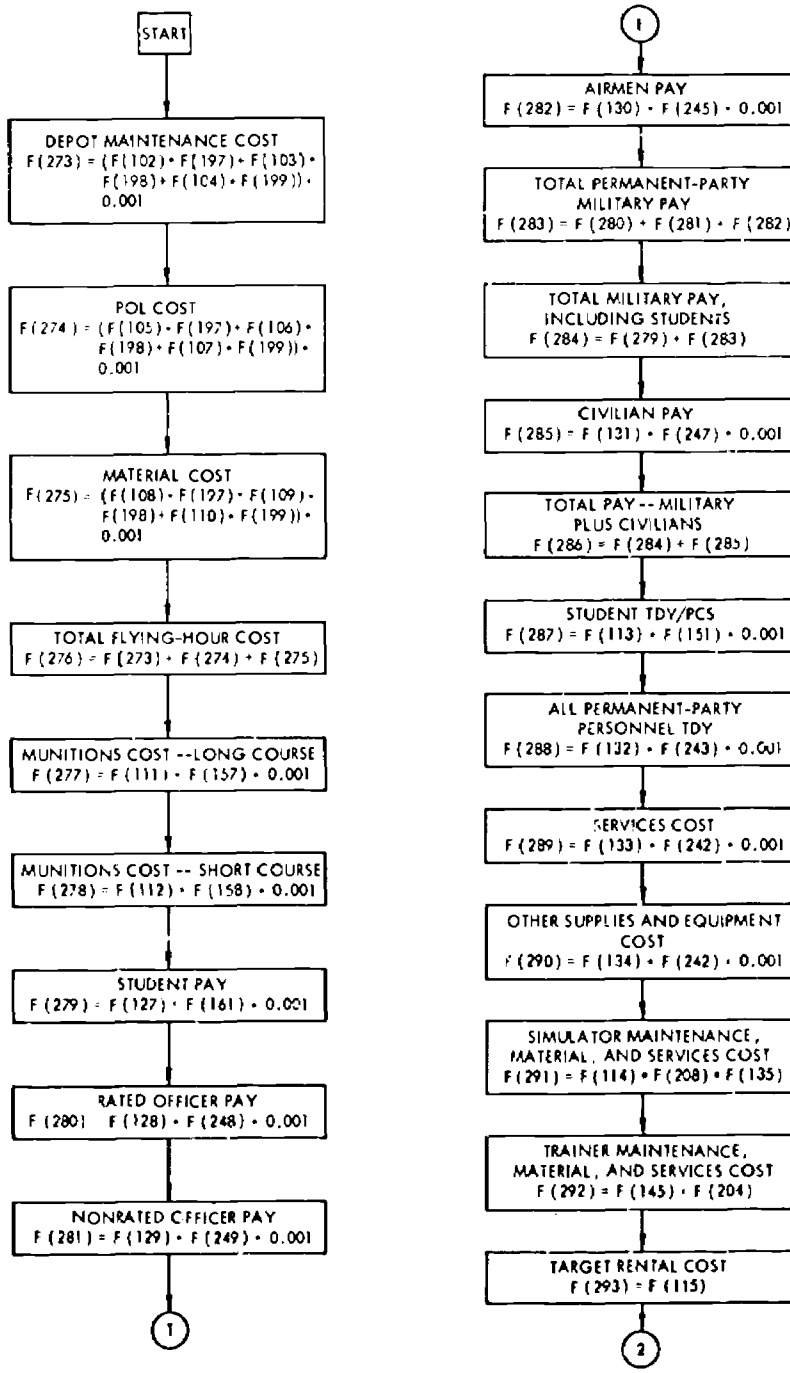


SUBROUTINE PERS (CONTINUED)

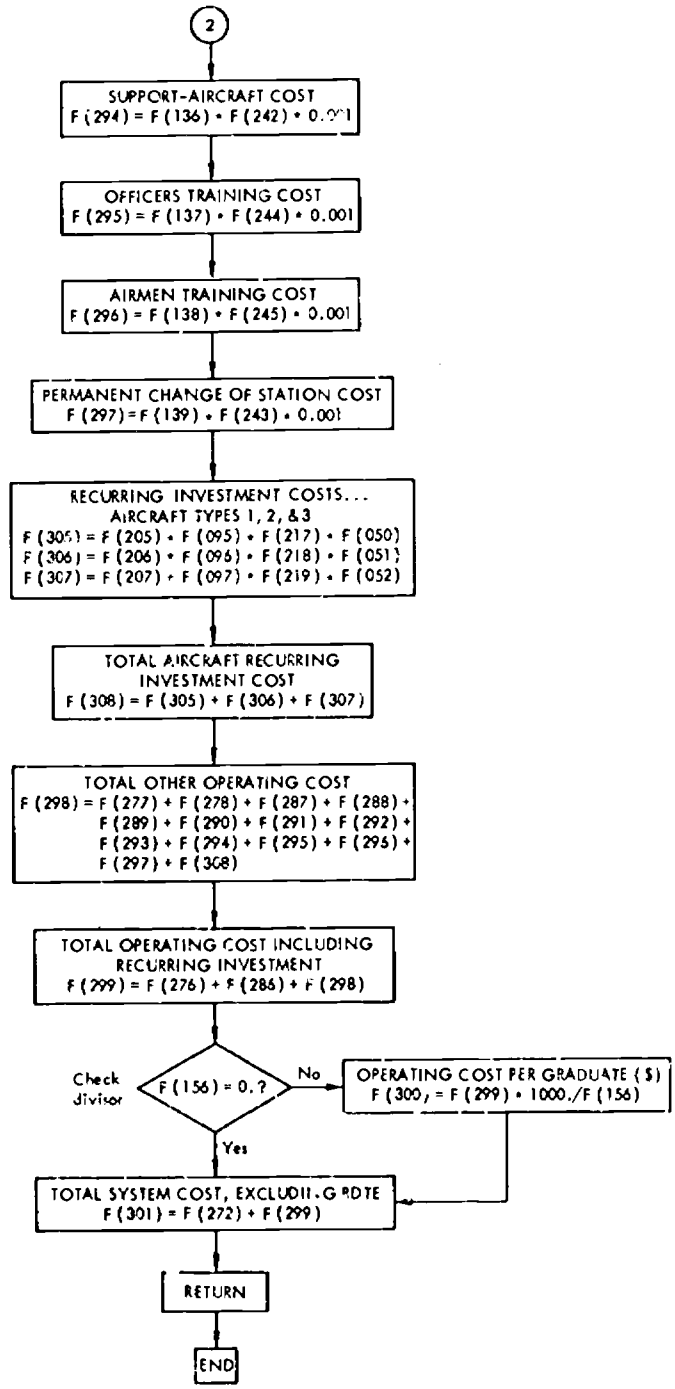

START
I = 1
COST OF AIRCRAFT, TRAINERS AND SIMULATORS TO BE PROCURED.
F(1,257) F(1,94) F(1,209)
I < 4?
Yes
No
I=1-3 -- Aircraft types 1-3
I=4 -- Simulators
I=5 -- Trainers
AIRCRAFT PROCUREMENT COST ALLOCATED TO PILOT TRAINING
F(1,257) F(1,257) F(1,49)
COST OF AIRCRAFT SPARES
F(1,262) F(140) F(1,257)
I = I+1
I< 5?
SIMULATOR PROCUREMENT COST ALLOCATED TO PILOT TRAINING
F(261) F(261) F(135)
COST OF SIMULATOR SPARES
F(266) F(100) F(261)
F(147) > 1.0?
S1 = 0.
S2 = 0.
CUMULATIVE CHANGE IN STUDENT LOAD UNTIL THRESHOLD IS REACHED
S1 = S1 + F(250)
1
CUMULATIVE CHANGE IN ADJ PERMANENT PARTY UNTIL THRESHOLD IS REACHED
S2 = S2 + F(254)
SET F VARIABLE TO S1
F(256) = S1
SET F VARIABLE TO S2
F(257) = S2
Is S1 under threshold value?
S1 < F(094)?
Yes
No
COST OF TRAINING EQUIPMENT AND SPARES FOR STUDENT LOAD INCREASE, IF JUSTIFIED BY THE INCREASE.
F(267) F(101) S1 0.001
S1 = 0.
Is S2 under threshold value?
S2 < F(122)?
COST OF BASE SUPPORT EQUIPMENT AND SPARES FOR PERMANENT PARTY INCREASE, IF JUSTIFIED BY THE INCREASE.
F(268) F(123) S2 0.001
COST OF SUPPLIES FOR PERMANENT PARTY INCREASE IF JUSTIFIED BY THE INCREASE
F(269) F(124) S2 0.001
S2 = 0.
COST OF TRAINING FOR PERMANENT PARTY INCREASE
F(270) F(125) F(254) 0.001
2



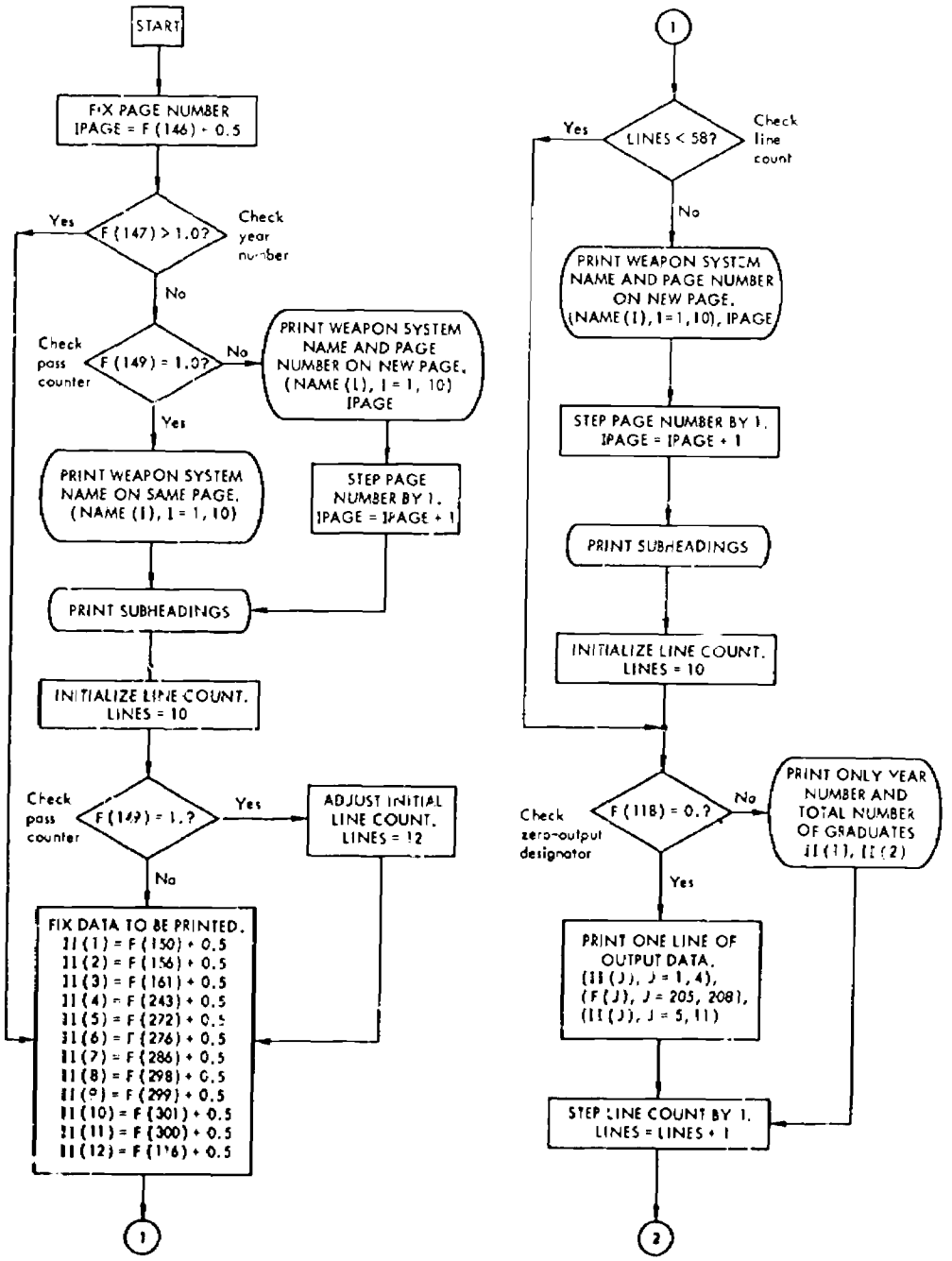
SUBROUTINE INCO (CONTINUED)



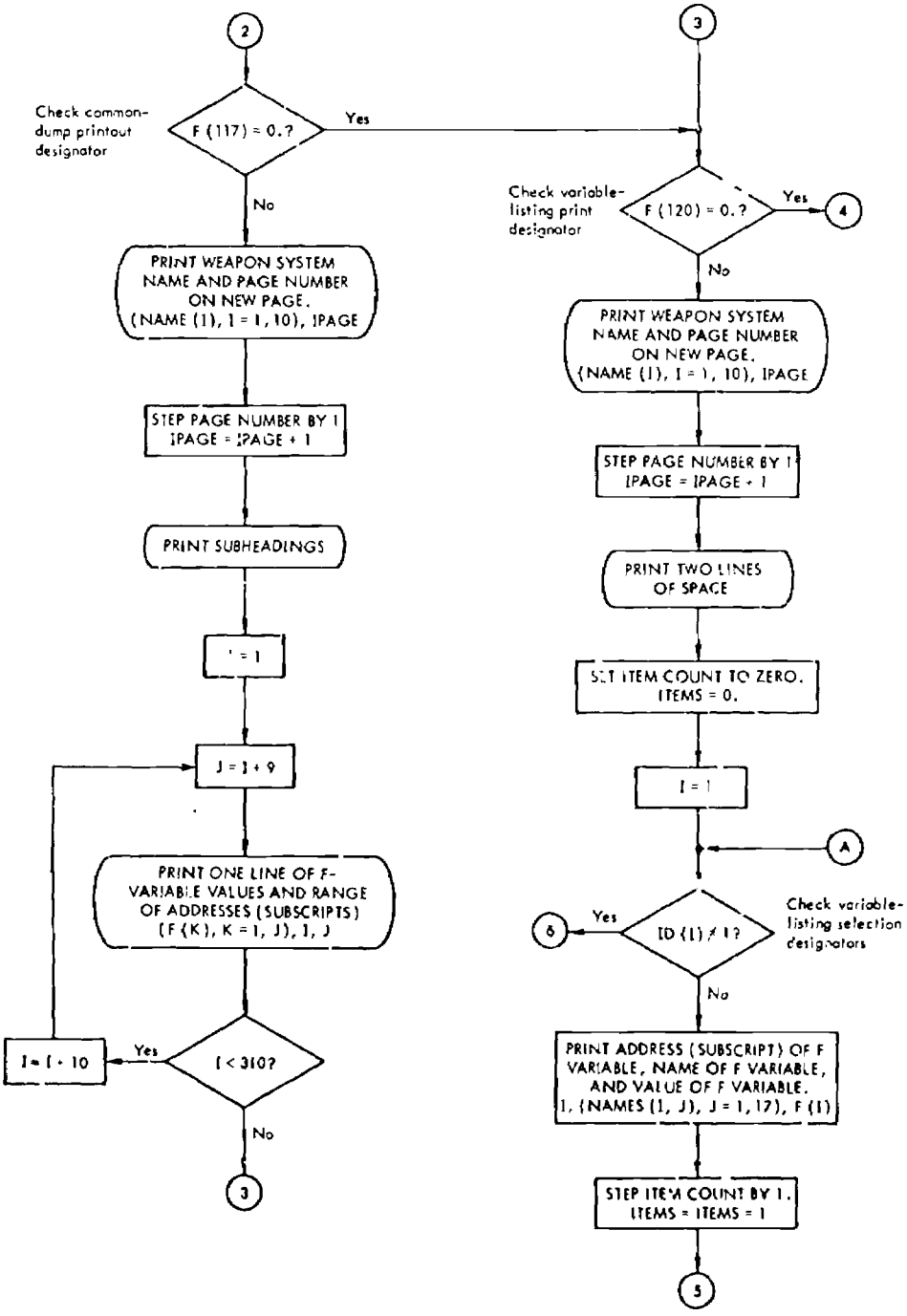
SUBROUTINE OPCO



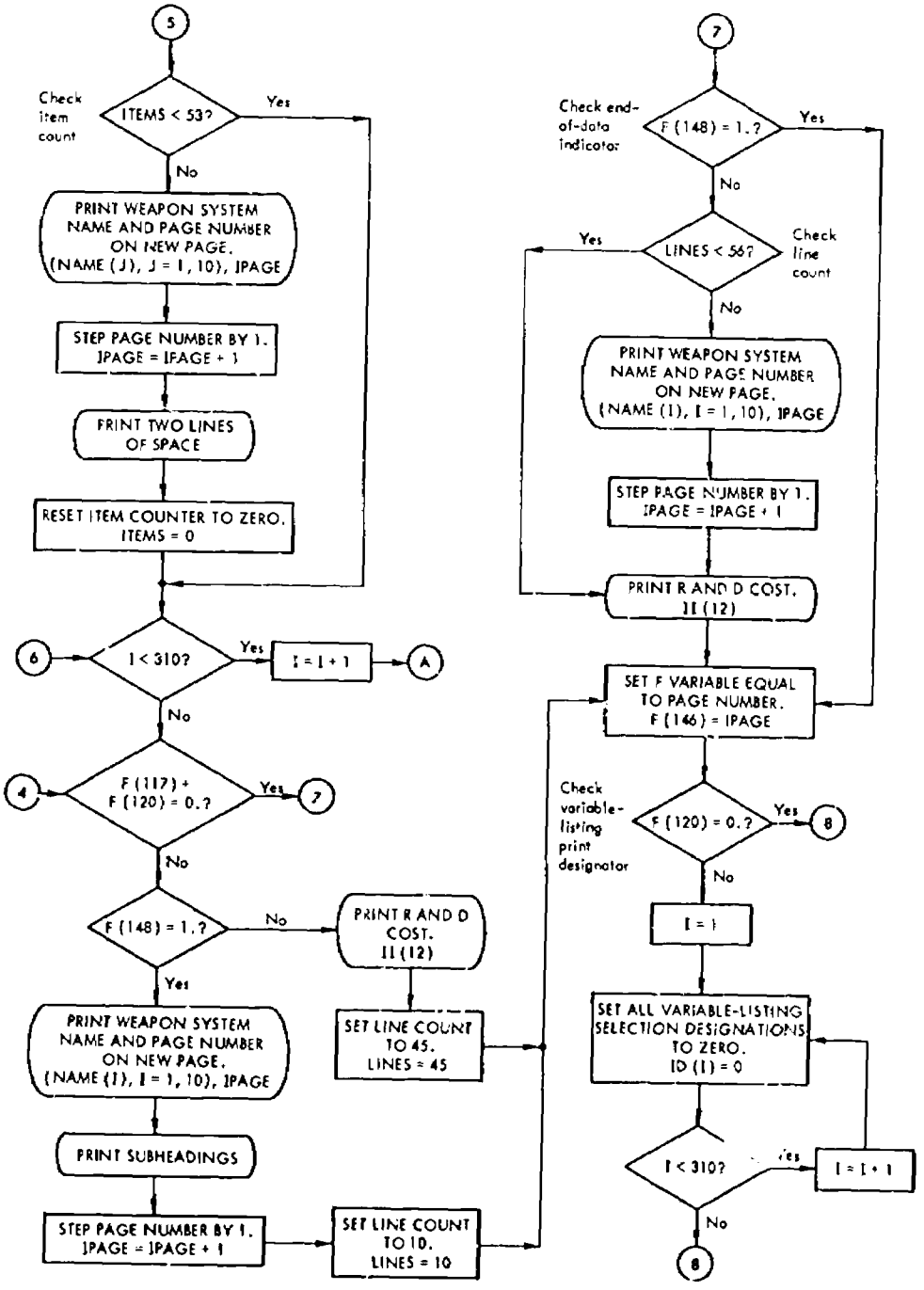
SUBROUTINE OPCO (CONTINUED)



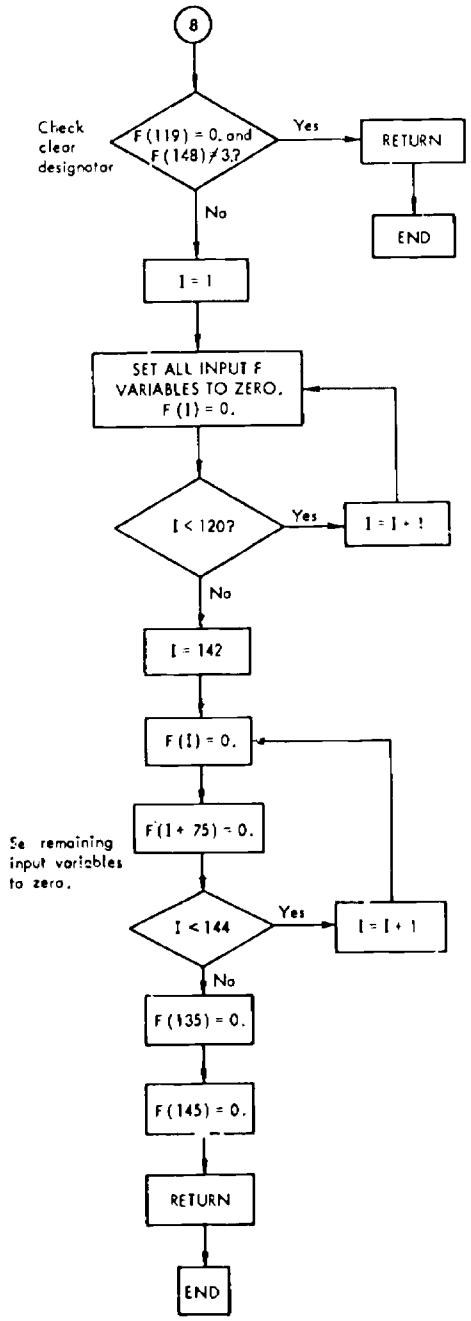
SUBROUTINE OUTPUT



SUBROUTINE OUTPUT (CONTINUED)



SUBROUTINE OUTPUT (CONTINUED)



SUBROUTINE OUTPUT (CONTINUED)

Appendix C

LISTING OF FORTRAN-IV (IBM 360/65) APT COMPUTER PROGRAM

```
      COMMON    F(310), TITLE(20), NAME(10), ID(310), NAMES(310,17)
      DIMENSION F1(8), I1(8)
C
C     MAIN ROUTINE OF APT COMPUTER PROGRAM THAT DETERMINES COSTS OF
C      STUDENTS IN ADVANCED PILOT TRAINING SCHOOL (CCTS)
C
C     SET ALL INPUT VARIABLES IN COMMON TO ZERO.
   10 DO 20 I = 1, 150
      F(I) = 0.
   20 CONTINUE
      F(217) = 0.
      F(218) = 0.
      F(219) = 0.
      ID1 = 0
C     SET VARIABLE-LISTING SELECTION DESIGNATORS TO ZERO.
      DO 25 I = 1, 310
      ID(I) = 0
   25 CONTINUE
C     SET PAGE NUMBER TO 1.
   30 IPAGE = 1
C     SET PASS COUNTER TO ZERO.
      F(149) = 0.
C     READ TITLE CARD.
      READ (5, 40) (TITLE(I), I = 1, 20)
   40 FORMAT (20A4)
      I = 0
C     READ CONSTANT INPUTS.
   50 READ (5, 60) (I1(K), F1(K), K = 1, 8)
   60 FORMAT (8(I3, F6.3, 1X))
      DO 70 K = 1, 8
      IF (I1(K) .EQ. 666) GO TO 80
      IF (I1(K) .EQ. 0 .AND. F1(K) .EQ. 0.) GO TO 70
      IF (I1(K) .GT. 216 .AND. I1(K) .LT. 220) GO TO 65
      IF (I1(K) .LE. 0 .OR. I1(K) .GT. 145) GO TO 140
   65 I = I1(K)
      F(I) = F1(K)
   70 CONTINUE
      GO TO 50
C     PRINT TITLE AND PAGE NUMBER ON NEW PAGE
   80 WRITE (6, 90) (TITLE(I), I = 1, 20), IPAGE
   90 FORMAT (1H1/ 10X, 20A4, 26X, 5HPAGE , I2)
C     SET PAGE NUMBER TO 2.
      F(146) = 2.0
      IF (ID1 .EQ. 1 .OR. F(141) .EQ. 0.) GO TO 100
C     READ IN ADDRESSES AND NAMES OF ALL F VARIABLES IF F(141) = 1.0.
   92 READ (5, 94) I, (NAMES(I,J), J = 1, 17)
   94 FORMAT (I3, 3X, 17A4)
      IF (I .NE. 310) GO TO 92
      ID1 = 1
C     SET CURRENT EQUIPMENT INVENTORIES TO ZERO.
  100 DO 105 I = 200, 204
      F(I) = 0.
  105 CONTINUE
C     SET ZERO-OUTPUT DESIGNATOR TO ZERO.
      F(118) = 0.
      SET YEAR COUNTER TO ZERO.
```

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      F(147) = 0.
C     READ WEAPON-SYSTEM CARD
      READ (5, 110) IW, (NAME(I), I = 1, 10)
  110 FORMAT (I2, 2X, 10A4)
      F(001) = IW
C     SET ALL OUTPUT VARIABLES IN COMMON TO ZERO EXCEPT EQUIPMENT
C      INVENTORIES AND AIRCRAFT RECURRING INVESTMENT COST FACTORS.
  120 DO 130 I = 151, 199
      F(I) = 0.
  130 CONTINUE
C     STORE VALUES OF AIRCRAFT RECURRING INVESTMENT COST FACTORS.
      TEMP1 = F(217)
      TEMP2 = F(218)
      TEMP3 = F(219)
      DO 132 I = 205, 310
      F(I) = 0.
  132 CONTINUE
C     RESTORE VALUES OF AIRCRAFT RECURRING INVESTMENT COST FACTORS.
      F(217) = TEMP1
      F(218) = TEMP2
      F(219) = TEMP3
C     SET VARIABLE-LISTING PRINT DESIGNATOR TO ZERO.
      F(120) = 0.
C     STEP YEAR COUNTER BY 1.
      F(147) = F(147) + 1.0
C     STEP PASS COUNTER BY 1.
      F(149) = F(149) + 1.0
C     READ WEAPON SYSTEM INPUTS.
      CALL READ
C     CALCULATE TRAINING HOURS AND EQUIPMENT REQUIREMENTS.
      CALL EQUIP
      IF (F(118) .EQ. 1.0) GO TO 135
C     CALCULATE PERSONNEL REQUIREMENTS.
      CALL PERS
C     CALCULATE INVESTMENT COSTS.
      CALL INCO
C     CALCULATE OPERATING COSTS.
      CALL OPCO
C     PRINT RESULTS.
  135 CALL OUTPUT
      IND = F(148) + 0.5
      GO TO (120, 100, 30, 160), IND
C     PRINT ERROR MESSAGE
  140 WRITE (6, 150) I
  150 FORMAT (1HO/ 10X,     11OHAN ADDRESS FOR ONE OF THE INPUT CONSTANT
     C FACTORS HAS NOT BEEN ENTERED PROPERLY.  THE LAST CORRECT ADDRESS
     CWAS , I3, 1H. / 10X, 29HTHIS JOB HAS BEEN TERMINATED. )
      CALL EXIT
C     PRINT END-OF-RUN STATEMENT
  160 WRITE (6, 170)
  170 FORMAT (1H1/ 10X,         49HEND OF FINAL RUN -- ALL DATA HAVE BEEN
     C PROCESSED.)
      CALL EXIT
      END
```

```
      SUBROUTINE READ
      COMMON    F(310), TITLE(20), NAME(10), ID(310), NAMES(310,17)
      DIMENSION F1(8), I1(8)
C
C     SUBROUTINE FOR READING WEAPON SYSTEM INPUT DATA
C
   10 I = 0
C     READ WEAPON SYSTEM INPUT DATA
   20 READ (5, 30) (I1(K), F1(K), K = 1, 8)
   30 FORMAT (8(I3, F6.3, 1X))
      DO 40 K = 1, 8
      IF (I1(K) .GT. 665) GO TO 50
      IF (I1(K) .EQ. 0 .AND. F1(K) .EQ. 0.) GO TO 40
      IF (I1(K) .GT. 216 .AND. I1(K) .LT. 220) GO TO 35
      IF (I1(K) .LE. 0 .OR. I1(K) .GT. 145) GO TO 60
   35 I = I1(K)
      F(I) = F1(K)
   40 CONTINUE
      GO TO 20
   50 IF (I1(K) .NE. 666 .AND. I1(K) .NE. 777 .AND. I1(K) .NE. 888 .AND.
     C I1(K) .NE. 999) GO TO 60
C     CURRENT YEAR (BEGINNING YEAR + YEAR NUMBER - 1.0)
      F(150) = F(121) + F(002) - 1.0
C     END-OF-DATA DESIGNATOR
C      F(148) = 1.0 -- END OF ONE YEAR'S DATA FOR ONE WEAPON SYSTEM
C               (I1(K) = 666)
C      F(148) = 2.0 -- END OF FINAL YEAR'S DATA FOR ONE WEAPON SYSTEM
C               (I1(K) = 777)
C      F(148) = 3.0 -- END OF FINAL YEAR'S DATA FOR FINAL WEAPON SYSTEM.
C               GO TO NEW RUN.
C               (I1(K) = 888)
C      F(148) = 4.0 -- END OF ALL RUNS
C               (I1(K) = 999)
      F(148) = (I1(K) - 500)/100
      IF (F(120) .EQ. 0.) RETURN
      READ (5, 55) (ID(I), I = 1, 80)
      IF (ID(1) .EQ. 9) GO TO 80
      READ (5, 55) (ID(I), I = 81, 160)
      READ (5, 55) (ID(I), I = 161, 240)
      READ (5, 55) (ID(I), I = 241, 305)
   55 FORMAT (80I1)
      RETURN
C     WRITE ERROR MESSAGE
   60 WRITE (6, 70) I
   70 FORMAT (1HO/10X, 107HAN ADDRESS FOR A WEAPON SYSTEM INPUT VARIABLE
     C HAS NOT BEEN ENTERED PROPERLY.  THE LAST CORRECT ADDRESS WAS ,I3,
     C 1H. / 10X, 29HTHIS JOB HAS BEEN TERMINATED. )
      CALL EXIT
C     SET ALL VARIABLE-LISTING SELECTION DESIGNATORS TO 1.
   80 DO 90 I = 1, 310
      ID(I) = 1
   90 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE EQUIP
      COMMON    F(310), TITLE(20), NAME(10), ID(310), NAMES(310,17)
C
C     SUBROUTINE FOR DETERMINING TRAINING HOURS AND EQUIPMENT
C      REQUIREMENTS
C
C     TOTAL NUMBER OF ENTERING STUDENTS
   10 F(151) = F(003) + F(004) + F(005) + F(006)
C     NUMBER OF ENTERING STUDENTS IN LONG COURSE
      F(152) = F(151) - F(003)
C     NUMBER OF ENTERING STUDENTS IN SHORT COURSE
      F(153) = F(003)
      DO 30 I = 1, 2
C     I = 1 -- LONG COURSE, I = 2 -- SHORT COURSE
C     NUMBER OF GRADUATES
      F(I+153) = F(I+8) * F(I+151)
      IF (F(118) .EQ. 1.0) GO TO 30
C     AVERAGE NUMBER OF STUDENTS PER YEAR
      F(I+156) = 0.5 * (F(I+151) + F(I+153))
C     AVERAGE STUDENT LOADS
      F(I+158) = F(I+156) * F(I+6) / 52.0
      F(I+170) = 0.
      DO 20 J = 1, 3
      K = 3 * I + J
      IF (F(K+17) .EQ. 0.) GO TO 20
C     STUDENT FLYING HOURS FOR AIRCRAFT TYPES 1, 2, AND 3
      F(K+158) = F(I+156) * F(K+7) / F(K+17)
C     INSTRUCTOR FLYING HOURS PER STUDENT
      F(I+170) = F(I+170) + (F(K+23) / F(K+17))
   20 CONTINUE
C     NUMBER OF HOURS INSTRUCTOR FLIES WITH STUDENTS
      F(I+172) = F(I+156) * F(I+170)
C     TOTAL INSTRUCTOR FLYING HOURS IN LEAD/TOW AIRCRAFT TYPE I
      F(I+214) = F(I+156) * F(I+141)
C     STUDENT SIMULATOR HOURS
      IF (F(038) .NE. 0.) F(I+175) = F(I+156) * F(I+16) / F(038)
C     STUDENT TRAINER HOURS
      F(I+178) = F(I+156) * F(I+40)
C     NUMBER OF GROUND-SCHOOL CLASSROOM HOURS
      IF (F(I+38) .NE. 0.) F(I+181) = F(I+156) * F(I+18) / F(I+38)
C     NUMBER OF GROUND-SCHOOL CLASSROOM HOURS TAUGHT BY CCTS INSTRUCTORS
      F(I+184) = F(I+181) * F(I+42)
C     NUMBER OF GROUND-SCHOOL CLASSROOM HOURS TAUGHT BY FTD INSTRUCTORS
      F(I+187) = F(I+181) - F(I+184)
   30 CONTINUE
C     TOTAL NUMBER OF GRADUATES
      F(156) = F(154) + F(155)
      IF (F(118) .EQ. 1.0) RETURN
C     TOTAL AVERAGE STUDENT LOAD
      F(161) = F(159) + F(160)
C     TOTAL STUDENT FLYING HOURS -- AIRCRAFT TYPES 1, 2, AND 3
      DO 40 I = 1, 3
      F(I+167) = F(I+161) + F(I+164)
   40 CONTINUE
      TOTALS -- HOURS INSTRUCTOR FLIES WITH STUDENTS, STUDENT SIMULATOR
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C       HOURS, STUDENT TRAINER HOURS, GS CLASSROOM HOURS, GS CLASSROOM
C       HOURS TAUGHT BY CCTS, AND GS CLASSROOM HOURS TAUGHT BY FTD
        DO 50 I = 1, 16, 3
        F(I+174) = F(I+172) + F(I+173)
   50 CONTINUE
C       SET INVENTORIES OF AIRCRAFT TYPES, SIMULATORS, AND TRAINERS
C       INITIALLY TO THOSE FOR BEGINNING YEAR.
        IF (F(147) .GT. 1.0) GO TO 70
        DO 60 I = 1, 5
        F(I+199) = F(I+57)
   60 CONTINUE
        DF = 10.**(-5)
   70 DO 90 I = 1, 5
C       I = 1-3 -- AIRCRAFT TYPES 1-3, I = 4 -- SIMULATORS, I = 5 --
C       TRAINERS
C       SET AIRCRAFT ATTRITION TERM INITIALLY TO ZERO.
        ATTR = 0.
        IF (I .GT. 3) GO TO 80
C       OTHER FLYING HOURS
        F(I+190) = F(I+46) * F(I+167)
C       ADJUST OTHER FLYING HOURS FOR AIRCRAFT TYPE 1 TO INCLUDE LEAD/TOW
C       AIRCRAFT FLYING HOURS.
        IF (I .EQ. 1) F(191) = F(047) * (F(168) + F(215) + F(215))
C       TOTAL FLYING HOURS
        F(I+193) = F(I+167) + F(I+190)
C       ADJUST TOTAL FLYING HOURS FOR AIRCRAFT TYPE 1 TO INCLUDE LEAD/TOW
C       AIRCRAFT FLYING HOURS.
        IF (I .EQ. 1) F(194) = F(194) + F(215) + F(216)
C       FLYING HOURS CHARGED TO PILOT TRAINING
        F(I+196) = F(I+49) * F(I+193)
C       NUMBER OF AIRCRAFT REQUIRED
        IF (F(I+54) .NE. 0.) F(I+204) = F(I+193) / F(I+54)
        GO TO (72, 74, 76), I
C       NUMBER OF SIMULATORS REQUIRED
   72 IF (F(053) .NE. 0.) F(208) = F(178) / F(053)
C       NUMBER OF TRAINERS REQUIRED
        IF (F(054) .NE. 0.) F(209) = F(181) / F(054)
C       NUMBER OF TYPE 1, TYPE 2 AIRCRAFT TO BE PROCURED FOR ATTRITION
   74 F(I+301) = F(I+44) * F(I+193) * DF
        ATTR = F(I+301)
        GO TO 80
C       NUMBER OF TYPE 3 AIRCRAFT TO BE PROCURED FOR ATTRITION
   76 F(304) = F(144) * F(196) * DF
        ATTR = F(304)
C       TOTAL NUMBER OF AIRCRAFT, SIMULATORS, AND TRAINERS TO BE PROCURED
   80 F(I+209) = F(I+204) - F(I+199) + ATTR
C       IF NUMBER TO BE PROCURED IS LESS THAN ZERO, SET NUMBER TO ZERO.
        IF (F(I+209) .LT. 0.) F(I+209) = 0.
C       CURRENT INVENTORY OF AIRCRAFT TYPES, SIMULATORS, AND TRAINERS
        F(I+199) = F(I+199) + F(I+209) - ATTR
   90 CONTINUE
C       SIMULATOR HOURS CHARGED TO PILOT TRAINING
        F(220) = F(178) * F(135)
        RETURN
        END
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      SUBROUTINE PERS
      COMMON    F(310), TITLE(20), NAME(10), ID(310), NAMES(310,17)
      DIMENSION T(8)
C
C     SUBROUTINE FOR DETERMINING PERSONNEL REQUIREMENTS
C
C     NUMBER OF FLYING INSTRUCTORS REQUIRED
      IF (F(033) .NE. 0.) F(221) = F(175) / F(033)
C     NUMBER OF SIMULATOR INSTRUCTORS REQUIRED
      IF (F(034) .NE. 0.) F(222) = F(178) / F(034)
C     NUMBER OF TRAINER INSTRUCTORS REQUIRED
      IF (F(035) .NE. 0.) F(223) = F(181) / F(035)
C     NUMBER OF GROUND-SCHOOL CCTS INSTRUCTORS REQUIRED
      IF (F(036) .NE. 0.) F(224) = F(187) / F(036)
C     NUMBER OF GROUND-SCHOOL FTD INSTRUCTORS REQUIRED
      IF (F(037) .NE. 0.) F(225) = F(190) / F(037)
C     TOTAL INSTRUCTORS REQUIRED
      F(226) = F(221) + F(222) + F(223) + F(224) + F(225)
C     NUMBER OF INSTRUCTOR SUPERVISORS AND ADMINISTRATIVE PERSONNEL
C      REQUIRED (SQUADRON LEVEL)
      F(227) = F(063) + F(064) * F(226)
C     NUMBER OF ACADEMIC-PROGRAM SUPERVISORS AND ADMINISTRATIVE
C      PERSONNEL REQUIRED (SQUADRON LEVEL)
      F(228) = F(065) + F(066) * F(116)
C     NUMBER OF STANDARD-EVALUATION PERSONNEL REQUIRED
      F(229) = F(067)
C     TOTAL NONSTUDENT OPERATIONS PERSONNEL
      F(230) = F(226) + F(227) + F(228) + F(229)
C     NUMBER OF MAINTENANCE PERSONNEL FOR AIRCRAFT TYPES 1, 2, AND 3
      DO 20 I = 1, 3
      F(I+230) = F(I+67) * F(I+196)
   20 CONTINUE
C     TOTAL AIRCRAFT MAINTENANCE PERSONNEL
      F(234) = F(231) + F(232) + F(233)
C     NUMBER OF SIMULATOR MAINTENANCE AND OPERATING PERSONNEL (FUNCTION
C      OF NUMBER OF SIMULATORS REQUIRED)
      F(235) = F(071) * F(208) * F(135)
C     NUMBER OF SIMULATOR MAINTENANCE AND OPERATING PERSONNEL (FUNCTION
C      OF SIMULATOR HOURS CHARGED TO PILOT TRAINING)
      IF (F(071) .LT. 1.0) F(235) = F(071) * F(220)
C     NUMBER OF TRAINER MAINTENANCE AND OPERATING PERSONNEL
      F(236) = F(072) * F(204)
C     TOTAL SIMULATOR AND TRAINER MAINTENANCE AND OPERATING PERSONNEL
      F(237) = F(235) + F(236)
C     OPERATIONS AND MAINTENANCE PERSONNEL
      F(238) = F(230) + F(234) + F(237)
C     ADMINISTRATIVE PERSONNEL (WING LEVEL)
      F(239) = F(073) + F(074) * F(238)
C     TOTAL STUDENT LOAD + OPERATIONS + MAINTENANCE PERSONNEL +
C      ADMINISTRATIVE PERSONNEL
      F(240) = F(161) + F(238) + F(239)
C     TOTAL SUPPORT PERSONNEL
      F(241) = F(075) + F(076) * F(240)
C     TOTAL PERSONNEL CHARGEABLE TO PILOT TRAINING, INCLUDING STUDENTS
      F(242) = F(240) + F(241)
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C       TOTAL PERMANENT PARTY PERSONNEL
        F(243) = F(242) - F(161)
C       RATED INSTRUCTORS (TEMPORARY VALUE)
        TEMP = F(221) + F(222) + F(223) + F(229)
C       TOTAL PERMANENT PARTY OFFICERS
        F(244) = TEMP + F(077) * F(224) + F(079) * F(225) +
     C          F(081) * F(227) + F(083) * F(228) + F(085) * F(234) +
     C          F(087) * F(237) + F(089) * F(239) + F(091) * F(241)
C       TOTAL PERMANENT PARTY AIRMEN
        F(245) = F(078) * F(224) + F(080) * F(225) + F(082) * F(227) +
     C          F(084) * F(228) + F(086) * F(234) + F(088) * F(237) +
     C          F(090) * F(239) + F(092) * F(241)
C       TOTAL PERMANENT PARTY MILITARY PERSONNEL
        F(246) = F(244) + F(245)
C       TOTAL CIVILIANS
        F(247) = F(243) - F(246)
C       TOTAL PERMANENT PARTY RATED OFFICERS
        F(248) = F(093) * F(244) + TEMP * (1.0 - F(093))
C       TOTAL PERMANENT PARTY NONRATED OFFICERS
        F(249) = F(244) - F(248)
        C = (1.0 + F(074)) * (1.0 + F(076))
        D = 0.
        IF (F(147) .EQ. 1.0) GO TO 40
C       STUDENT LOAD CHANGE
        F(250) = F(161) - T(4)
C       TOTAL PERSONNEL CHANGE, INCLUDING STUDENTS
        F(251) = F(242) - T(5)
C       CHANGE IN TOTAL PERMANENT PARTY PERSONNEL
        F(252) = F(243) - T(6)
C       CHANGE IN TOTAL PERMANENT PARTY MILITARY PERSONNEL
        F(253) = F(246) - T(7)
        DO 30 I = 1, 3
        D = D + ((F(I+49) - T(I)) * F(I+67) * F(I+193))
   30 CONTINUE
        IF (F(071) .LT. 1.) D = D + (F(135) - T(8)) * F(178) * F(071)
        IF (F(071) .GE. 1.) D = D + (F(135) - T(8)) * F(208) * F(071)
C       ADJUSTMENT TO ELIMINATE EFFECT ON INVESTMENT COST OF CHANGES IN
C        ALLOCATION FRACTIONS
   40 F(255) = C * D
C       PERMANENT PARTY CHANGE LESS CHANGE DUE TO VARIATIONS IN ALLOCATION
C        FRACTIONS
        F(254) = F(252) - F(255)
C       STORE F(050), F(051), F(052), F(161), F(242), F(243), F(246),
C        AND F(135).
        T(1) = F(050)
        T(2) = F(051)
        T(3) = F(052)
        T(4) = F(161)
        T(5) = F(242)
        T(6) = F(243)
        T(7) = F(246)
        T(8) = F(135)
        RETURN
        END
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```
      SUBROUTINE INCO
      COMMON    F(310), TITLE(20), NAME(10), ID(310), NAMES(310,17)
C
C     SUBROUTINE FOR DETERMINING INVESTMENT COSTS
C
   10 DO 20 I = 1, 5
C     COST OF AIRCRAFT, TRAINERS, AND SIMULATORS TO BE PROCURED
      F(I+257) = F(I+94) * F(I+209)
      IF (I .GT. 3) GO TO 20
C     ALLOCATE AIRCRAFT PROCUREMENT COST TO PILOT TRAINING.
      F(I+257) = F(I+257) * F(I+89)
C     COST OF AIRCRAFT SPARES
      F(I+262) = F(140) * F(I+257)
   20 CONTINUE
C     ALLOCATE SIMULATOR PROCUREMENT COST TO PILOT TRAINING.
      F(261) = F(261) * F(135)
C     COST OF SIMULATOR SPARES
      F(266) = F(100) * F(261)
      IF (F(147) .GT. 1.0) GO TO 30
      S1 = 0.
      S2 = 0.
   30 S1 = S1 + F(250)
      S2 = S2 + F(254)
      F(256) = S1
      F(257) = S2
      IF (S1 .LT. F(094)) GO TO 40
C     COST OF TRAINING EQUIPMENT AND SPARES FOR STUDENT LOAD INCREASE
C      WHEN JUSTIFIED BY THE INCREASE
      F(267) = F(101) * S1 * 0.001
      S1 = 0.
   40 IF (S2 .LT. F(122)) GO TO 50
C     COST OF BASE SUPPORT EQUIPMENT AND SPARES FOR PERMANENT PARTY
C      INCREASE WHEN JUSTIFIED BY THE INCREASE
      F(268) = F(123) * S2 * 0.001
C     COST OF SUPPLIES FOR PERMANENT PARTY INCREASE WHEN JUSTIFIED BY
C      THE INCREASE
      F(269) = F(124) * S2 * 0.001
      S2 = 0.
C     COST OF TRAINING FOR PERMANENT PARTY INCREASE
   50 F(270) = F(125) * F(254) * 0.001
C     COST OF TRAVEL (PCS) FOR PERMANENT PARTY INCREASE
      F(271) = F(126) * F(254) * 0.001
      IF (F(270) .LT. 0.) F(270) = 0.
      IF (F(271) .LT. 0.) F(271) = 0.
C     TOTAL INCREASE IN INVESTMENT COST
      DO 60 I = 258, 271
      F(272) = F(272) + F(I)
   60 CONTINUE
      RETURN
      END
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      SUBROUTINE OPCO
      COMMON    F(310), TITLE(20), NAME(10), ID(310), NAMES(310,17)
C
C     SUBROUTINE FOR CALCULATING OPERATING COSTS
C
C     DEPOT MAINTENANCE COST
   10 F(273) = (F(102)*F(197) + F(103)*F(198) + F(104)*F(199)) * 0.001
C     POL COST
      F(274) = (F(105)*F(197) + F(106)*F(198) + F(107)*F(199)) * 0.001
C     MATERIAL COST
      F(275) = (F(108)*F(197) + F(109)*F(198) + F(110)*F(199)) * 0.001
C     TOTAL FLYING-HOUR COST
      F(276) = F(273) + F(274) + F(275)
C     MUNITIONS COST -- LONG COURSE
      F(277) = F(111) * F(157) * 0.001
C     MUNITIONS COST -- SHORT COURSE
      F(278) = F(112) * F(158) * 0.001
C     PAY -- STUDENTS
      F(279) = F(127) * F(161) * 0.001
C     PAY -- RATED OFFICERS
      F(280) = F(128) * F(248) * 0.001
C     PAY -- NONRATED OFFICERS
      F(281) = F(129) * F(249) * 0.001
C     PAY -- AIRMEN
      F(282) = F(130) * F(245) * 0.001
C     PAY -- TOTAL PERMANENT PARTY MILITARY
      F(283) = F(280) + F(281) + F(282)
C     PAY -- TOTAL MILITARY, INCLUDING STUDENTS
      F(284) = F(279) + F(283)
C     PAY -- CIVILIANS
      F(285) = F(131) * F(247) * 0.001
C     TOTAL PAY -- MILITARY PLUS CIVILIANS
      F(286) = F(284) + F(285)
C     TDY/PCS -- STUDENTS
      F(287) = F(113) * F(151) * 0.001
C     TDY -- ALL PERMANENT PARTY PERSONNEL
      F(288) = F(132) * F(243) * 0.001
C     SERVICES COST
      F(289) = F(133) * F(242) * 0.001
C     OTHER SUPPLIES AND EQUIPMENT COSTS
      F(290) = F(134) * F(242) * 0.001
C     SIMULATOR MAINTENANCE, MATERIAL, AND SERVICES COST
      F(291) = F(114) * F(208) * F(135)
C     TRAINER MAINTENANCE, MATERIAL, AND SERVICES
      F(292) = F(145) * F(204)
C     TARGET RENTAL
      F(293) = F(115)
C     SUPPORT AIRCRAFT COST
      F(294) = F(136) * F(242) * 0.001
C     OFFICERS TRAINING COST
      F(295) = F(137) * F(244) * 0.001
C     AIRMEN TRAINING COST
      F(296) = F(138) * F(245) * 0.001
C     PERMANENT CHANGE OF STATION
      F(297) = F(139) * F(243) * 0.001
```

```
C     RECURRING INVESTMENT COSTS -- AIRCRAFT TYPES 1, 2, 3
      F(305) = F(205) * F(095) * F(217) * F(050)
      F(306) = F(206) * F(096) * F(218) * F(051)
      F(307) = F(207) * F(097) * F(219) * F(052)
C     TOTAL AIRCRAFT RECURRING INVESTMENT COST
      F(308) = F(305) + F(306) + F(307)
C     TOTAL OTHER OPERATING COST
      F(298) = F(277) + F(278) + F(287) + F(288) + F(289) + F(290) +
     C         F(291) + F(292) + F(293) + F(294) + F(295) + F(296) +
     C         F(297) + F(308)
C     TOTAL OPERATING COST, INCLUDING RECURRING INVESTMENT
      F(299) = F(276) + F(286) + F(298)
C     OPERATING COST PER GRADUATE ($)
      IF (F(156) .NE. 0.) F(300) = F(299) * 1000. / F(155)
C     TOTAL SYSTEM COST, EXCLUDING R AND D
      F(301) = F(272) + F(299)
      RETURN
      END
```

```
      SUBROUTINE OUTPUT
      COMMON    F(310), TITLE(20), NAME(10), ID(310), NAMES(310,17)
      DIMENSION II(12)
C
C     SUBROUTINE FOR PRINTING OUTPUT
C
C     FIX PAGE NUMBER.
   10 IPAGE = F(146) + 0.5
C     PRINT WEAPON SYSTEM HEADING FOR FIRST YEAR.
      IF (F(147) .GT. 1.0) GO TO 60
      IF (F(149) .EQ. 1.0) GO TO 30
      WRITE (6, 70) (NAME(I), I = 1, 10), IPAGE
C     STEP PAGE NUMBER BY 1.
      IPAGE = IPAGE + 1
      GO TO 45
   30 WRITE (6, 40) (NAME(I), I = 1, 10)
   40 FORMAT (1H /  52X, 10A4 / 29X,          82H(ALL OUTPUT COSTS EXCEPT
     C OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.) / )
C     PRINT SUBHEADINGS.
   45 WRITE (6, 50)
   50 FORMAT (1H / 37X, 3(3HNO., 6X), 50X, 2(4X, 4HOPER) / 21X, 3HAVG,
     C 4X, 4HPERM, 4X, 6HTYPE 1, 3X, 6HTYPE 2, 3X, 6HTYPE 3, 4X, 3HNO.,
     C 14X, 6HFLYING, 13X, 5HOTHER, 4X, 5HTOTAL, 4X, 4HPLUS, 2X,
     C 8HCOST PER / 12X, 3HNO., 5X, 5HSTUD., 3X, 5HPARTY, 4X,
     C 3(4HACFT, 5X), 4HSIMS, 5X, 3HINV, 6X, 4HHOUR, 14X, 2(4HOPER, 5X),
     C 3HINV, 5X, 4HGRAD / 1X, 4HYEAR, 6X, 4HGRAD, 5X, 4HLOAD, 4X,
     C 4HPERS, 5X, 4(3HREQ, 6X), 2(4HCOST, 5X), 1X, 3HPAY,
     C 3(5X, 4HCOST), 4X, 3H($) / )
C     INITIALIZE LINE COUNT.
      LINES = 10
      IF (F(149) .EQ. 1.0) LINES = 12
C     FIX DATA TO BE PRINTED.
   60 II(1) = F(150) + 0.5
      II(2) = F(156) + 0.5
      II(3) = F(161) + 0.5
      II(4) = F(243) + 0.5
      II(5) = F(272) + 0.5
      II(6) = F(276) + 0.5
      II(7) = F(286) + 0.5
      II(8) = F(298) + 0.5
      II(9) = F(299) + 0.5
      II(10) = F(301) + 0.5
      II(11) = F(300) + 0.5
      II(12) = F(116) + 0.5
      IF (LINES .LT. 58) GO TO 90
C     PRINT HEADINGS AND PAGE NUMBER ON NEW PAGE.
      WRITE (6, 70) (NAME(I), I = 1, 10), IPAGE
   70 FORMAT (1H1/ 52X, 10A4, 27X, 5HPAGE , I2/29X,82H(ALL OUTPUT COSTS
     CEXCEPT OPERATING COST PER GRADUATE ARE IN THOUSANDS OF DOLLARS.)/)
C     STEP PAGE NUMBER BY 1.
      IPAGE = IPAGE + 1
   80 WRITE (6, 50)
C     SET LINE COUNT TO 10.
      LINES = 10
      PRINT ALL DATA.
```

```
   90 IF (F(118) .EQ. 0.) WRITE (6, 100) (II(J), J = 1, 4),
     C (F(J), J = 205, 208), (II(J), J = 5, 11)
       IF (F(118) .EQ. 1.0) WRITE (6, 100) II(1), II(2)
  100 FORMAT (1X, I4, 1X, 3(I8, 1X), 4(F8.2, 1X), 6(I8, 1X), I8)
C     STEP LINE COUNT BY 1.
      LINES = LINES + 1
      IF (F(117) .EQ. 0.) GO TO 150
      WRITE (6, 70) (NAME(I), I = 1, 10), IPAGE
C     STEP PAGE NUMBER BY 1.
      IPAGE = IPAGE + 1
      WRITE (6, 110)
  110 FORMAT (1HO/// 58X, 11HCOMMON DUMP /// 8X, 1H1, 11X, 1H2, 11X,
     C 1H3, 11X, 1H4, 11X, 1H5, 11X, 1H6, 11X, 1H7, 11X, 1H8, 11X, 1H9,
     C 10X, 2H10, 6X, 9HADDRESSES //)
C     PRINT COMMON DUMP.
      DO 130 I = 1, 310, 10
      J = I + 9
      WRITE (6, 120) (F(K), K = I, J), I, J
  120 FORMAT (1X, 10(F11.3, 1X), 2X, I4, 1H-, I4)
  130 CONTINUE
  150 IF (F(120) .EQ. 0.) GO TO 180
      WRITE (6, 70) (NAME(I), I = 1, 10), IPAGE
C     STEP PAGE NUMBER BY 1.
      IPAGE = IPAGE + 1
      WRITE (6, 155)
  155 FORMAT (1H /)
      ITEMS = 0
C     PRINT ADDRESS, NAME, AND VALUE OF EACH F VARIABLE SO DESIGNATED.
      DO 170 I = 1, 310
      IF (IO(I) .NE. 1) GO TO 170
      WRITE (6, 160) I, (NAMES(I,J), J = 1, 17), F(I)
  160 FORMAT (20X, I3, 3X, 17A4, 7X, F15.5)
C     STEP ITEM COUNT BY 1.
      ITEMS = ITEMS + 1
      IF (ITEMS .LT. 53) GO TO 170
      WRITE (6, 70) (NAME(J), J = 1, 10), IPAGE
C     STEP PAGE NUMBER BY 1.
      IPAGE = IPAGE + 1
      WRITE (6, 155)
C     RESET ITEM COUNT TO ZERO.
      ITEMS = 0
  170 CONTINUE
  180 IF (F(117) + F(120) .EQ. 0.) GO TO 200
      IF (F(148) .EQ. 1.0) GO TO 190
      WRITE (6, 220) II(12)
C     SET LINE COUNT TO 45
      LINES = 45
      GO TO 230
  190 WRITE (6, 70) (NAME(I), I = 1, 10), IPAGE
      WRITE (6, 50)
C     STEP PAGE NUMBER BY 1.
      IPAGE = IPAGE + 1
C     SET LINE COUNT TO 10.
      LINES = 10
      GO TO 230
  200 IF (F(148) .EQ. 1.0) GO TO 230
```

```
      IF (LINES .LT. 56) GO TO 210
      WRITE (6, 70) (NAME(I), I = 1, 10), IPAGE
C     STEP PAGE NUMBER BY 1.
      IPAGE = IPAGE + 1
  210 WRITE (6, 220) II(12)
  220 FORMAT (1HO/ 10X, 17HR AND D COST  =  , I8)
C     FLOAT PAGE NUMBER.
  230 F(146) = IPAGE
      IF (F(120) .EQ. 0.) GO TO 250
      DO 240 I = 1, 310
      ID(I) = 0
  240 CONTINUE
  250 IF (F(119) .EQ. 0. .AND. F(148) .NE. 3.) RETURN
C     CLEAR ALL WEAPON SYSTEM INPUT VARIABLES IN COMMON.
      DO 260 I = 1, 120
      F(I) = 0.
  260 CONTINUE
      DO 270 I = 142, 144
      F(I) = 0.
      F(I+75) = 0.
  270 CONTINUE
      F(135) = 0.
      F(145) = 0.
      RETURN
      END
```